

# Official Transcript of Proceedings

## NUCLEAR REGULATORY COMMISSION

Title: Dominion Nuclear North Anna LLC

Docket Number: 52-008-ESP; ASLBP No. 04-822-02-ESP

Location: Louisa, Virginia

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UNITED STATES OF AMERICA  
U.S. NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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| IN THE MATTER OF  |                       |
| DOMNINION NUCLEAR | Docket No. 52-008-ESP |
| NORTH ANNA LLC    | ASLBP 04-822-02-ESP   |
|                   |                       |
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Louisa County Public Meeting Room  
Executive Board Room  
1 Woolfolk Avenue  
Louisa, Virginia

Thursday, April 26, 2007  
9:00 a.m.

BEFORE:

ALEX S. KARLIN, Administrative Judge  
THOMAS ELLEMAN, Administrative Judge  
RICHARD F. COLE, Administrative Judge

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Topic

|   |                                   |     |
|---|-----------------------------------|-----|
| 3 | Zero Release Commitment . . . . . | 609 |
| 6 | Seismic Safety . . . . .          | 693 |

E-X-H-I-B-I-T-S

|                 |                 |             |             |
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Dominion

|    |                       |     |     |
|----|-----------------------|-----|-----|
| 16 | Slides for Dominion's | 692 | 692 |
|----|-----------------------|-----|-----|

presentation on seismic safety,  
including attached statements of  
qualifications

Board

|   |  |     |     |
|---|--|-----|-----|
| 1 | Liquid Radioactive Release Lessons<br>Learned Task Force Final Report<br>dated September 1, 2006 | 793 | 793 |
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P-R-O-C-E-E-D-I-N-G-S

9:01 a.m.

1  
2  
3 JUDGE KARLIN: On the record. Mr. Court  
4 Reporter, we're on the record please. Good morning,  
5 everyone. Again, I'm Alex Karlin and this is the  
6 Atomic Safety and Licensing Board Panel convening in  
7 the matter of the application by Dominion Nuclear  
8 North Anna for an early site permit from the NRC. It  
9 looks like our attendance is sustaining at a  
10 reasonable level. But hopefully, we're thinking that  
11 we may be able to finish today. I think we have two  
12 more topics to go over and then a couple of quick,  
13 three I think, relatively quick legal points that I'd  
14 like to hear from counsel. We would like to hear from  
15 counsel on.

16 So today we commence with the topic I  
17 think we called No. -- It was No. 6 which we called  
18 the Zero Release Commitment. Anything from the  
19 counsel that they need to say this morning?

20 MR. WEISMAN: No, Your Honor.

21 JUDGE KARLIN: No.

22 MR. LEWIS: Not right now.

23 JUDGE KARLIN: All right. Thanks. Okay.  
24 We have a panel, I believe that all of you gentlemen  
25 have already previously been sworn on this matter. So

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1 I'll just remind you that you are still under oath and  
2 please testify accordingly.

3 Perhaps for the record, you could identify  
4 yourselves to the Court Reporter. Mr. Bagchi.

5 MR. BAGCHI: My name is Goutam Bagchi.

6 JUDGE KARLIN: And your position.

7 MR. BAGCHI: With NRC. I'm a Senior Local  
8 Advisor in the Office of New Reactors.

9 MR. DEHMEL: My name is Jean-Claude  
10 Dehmel. I'm a Senior Health Physicist with the Office  
11 of New Reactors with the NRC.

12 MR. STOETZEL: My name is Greg Stoetzel.  
13 I'm the Principal Safety Health Engineer with Pacific  
14 Northwest National Laboratory.

15 MR. VAIL: My name is Lance Vail. I'm a  
16 Senior Research Engineer with Pacific Northwest  
17 National Laboratory.

18 JUDGE KARLIN: Good morning. Thank you  
19 for coming. This is one of these panels where we did  
20 not ask the witnesses to provide a presentation. We  
21 thought we understood a little bit from the materials  
22 and this is also one where the Applicant, we invited  
23 them to put a panel together. It was at the last  
24 minute and they decided that they didn't need to do  
25 that. So we'll just hear from the staff witnesses,

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1 the four of you.

2 As a prelude, we note that what we call  
3 the zero release commitment is essentially what the  
4 NRC has proposed as Permit Condition No. 4 to this and  
5 that proposed permit condition appears, I guess it is,  
6 in the safety evaluation report. Interestingly enough  
7 as I see it, I think the staff can correct me if I'm  
8 wrong, the staff did propose identical permit  
9 conditions for two other early site permits that have  
10 recently been issued. They went through an  
11 adjudicatory proceeding and identical permit  
12 conditions were proposed. That was the subject of  
13 Board inquiry on both of the other early site permits.  
14 Boards were troubled by those proposed conditions and  
15 in both of those cases, the Commission undertook on  
16 review, not really on appeal, but on review to look at  
17 that and to provide some further instruction and  
18 modify the proposed permit conditions slightly.

19 I also note that the staff has submitted  
20 to us on April 10<sup>th</sup> in the other submissions that were  
21 due that day a statement that in light of the  
22 Commission's modification to Permit Condition 4 in  
23 both of those other proceedings, the Clinton and the  
24 Grand Gulf ESPs, it's my understanding that the staff  
25 is proposing to adopt the same language that in

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1 proposed Permit Condition 4 that was used by the  
2 Commission in those other two cases. Is that correct,  
3 Mr. Bagchi?

4 MR. BAGCHI: Yes, Your Honor.

5 JUDGE KARLIN: Good. Okay. So rather  
6 than focus on the one the staff originally proposed,  
7 we probably -- We might look at that briefly but then  
8 go to what the Commission has proposed. Part of our  
9 concern is to understand what is intended by that  
10 language by the staff and the Commission and to  
11 understand whether or not that's realistically  
12 achievable or appropriate or meets the other legal  
13 conditions that we're concerned with. Our concerns  
14 are a little bit different than what was raised in the  
15 other cases perhaps and therefore may warrant a little  
16 bit different look.

17 Okay. If I may, I want to -- I don't know  
18 whether I'll go to -- I'll go to your own permit  
19 condition. The original proposed Permit Condition 4,  
20 if you all have that in front of you, we can take a  
21 look at that. The NRC staff proposes to include a  
22 condition in any ESP that might be issued in  
23 connection with this application, requiring that the  
24 Applicant referencing such an ESP design any new units  
25 rad waste systems and I think we want to focus on, I

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1 want to focus a little bit on this with features to  
2 preclude any and all accidental releases. Design a  
3 system rad waste systems with features to preclude any  
4 and all accidental releases.

5 Now the Commission changed that in several  
6 ways of interest. Their proposed -- Or the condition  
7 that they have imposed in the other two ESPs is that  
8 this permit condition say "radioactive waste  
9 management systems, structures and components as  
10 defined in Reg. Guide 1.143." So there's a much  
11 better definition, I think, of the systems subject to  
12 this requirement for a future reactor and then here's  
13 the parallel language or close to parallel language,  
14 "include features to preclude accidental releases of  
15 radionuclides into liquid pathways."

16 So as I see it, the Commission's  
17 modification provides a much better definition of the  
18 rad waste management systems, structures and  
19 components that are subject to this requirement and  
20 deletes the phrase "any and all." Thus, it says,  
21 "must include features to preclude accidental releases  
22 of radionuclides into potential liquid pathways."

23 Mr. Bagchi, maybe I could just start with  
24 you. I've been confused about the term "accidental  
25 releases." We've been talking about that and

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1 sometimes it seems to be you're saying that that means  
2 a sudden release and other times it's as distinguished  
3 from an insidious or undetected slow leak. Is it your  
4 interpretation that accidental releases in this permit  
5 condition includes both sudden releases and insidious,  
6 slow, undetected releases?

7 MR. BAGCHI: In my view --

8 JUDGE KARLIN: What does "accidental"  
9 cover in this context in your view?

10 MR. BAGCHI: In this context, accidental  
11 does not cover undetected leakages through pipes and  
12 other locations.

13 JUDGE KARLIN: It does not.

14 MR. BAGCHI: Does not.

15 JUDGE KARLIN: Okay. So you're suggesting  
16 -- Would that mean that this condition does not --  
17 When it says "it must include features to preclude  
18 accidental releases," it's not requiring features to  
19 preclude slow leaks. It is not requiring features to  
20 preclude slow leaks.

21 MR. BAGCHI: Your Honor, the Commission  
22 modification relates to structures, systems and  
23 components associated with Regulatory Guide 1.143.

24 JUDGE KARLIN: All right.

25 MR. BAGCHI: And although I don't have it

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1 right in front of me, it does not include certain  
2 structures, for example, spent fuel pool and spent  
3 fuel systems.

4 JUDGE KARLIN: Okay. So it does not  
5 include spent fuel pools. So those spent fuel pools  
6 would not be encompassed by the proposed Permit  
7 condition 4 as modified by the Board and by the  
8 Commission and then by you.

9 MR. BAGCHI: That is my understanding at  
10 the moment.

11 JUDGE COLE: Would it be included in the  
12 language of the Permit Condition No. 4 as stated in  
13 this SER?

14 MR. BAGCHI: The permit condition as  
15 proposed in the draft permit condition incorporates  
16 the words given by the Commission. So they are  
17 different from what is in the ACR Supplement 1 or the  
18 NUREG, original ACR NUREG 1835.

19 JUDGE COLE: So this isn't the language  
20 that's in the proposed permit.

21 MR. BAGCHI: Yes, Your Honor.

22 JUDGE KARLIN: Right. And the Commission  
23 has come up with new language and the staff has  
24 adopted that new language. So the phrase "radioactive  
25 waste management systems, structures and components,

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1 as defined in Reg. Guide 1.143 does not include leaks  
2 from spent fuel pools."

3 MR. BAGCHI: That's my recollection. I  
4 don't have the reg. guide in front of me, Your Honor.

5 JUDGE KARLIN: Okay. What else does it  
6 not include in terms of things that might leak?

7 MR. BAGCHI: There are so many things in  
8 a huge nuclear power plant that could leak. I can't  
9 begin to list all of them. It is only those  
10 associated with radioactive waste management system  
11 that's covered.

12 JUDGE KARLIN: Okay. I agree.  
13 Radioactive waste leaks. I was under the impression  
14 that that phrase, and I admit I haven't researched or  
15 read that reg. guide carefully, covered a lot of  
16 ground and maybe it does, but I didn't realize it  
17 excluded significant items.

18 MR. BAGCHI: Yes, it also has things like  
19 level indicators, alarms in the control room, those  
20 kinds of things.

21 JUDGE KARLIN: Right, but does a  
22 radioactive waste managed systems, structures and  
23 components include the tanks where radioactive liquid  
24 waste would be collected?

25 MR. BAGCHI: Certainly does, Your Honor.

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1 JUDGE KARLIN: Does it include sumps where  
2 radioactive liquid waste effluent to be collected?

3 MR. BAGCHI: It would be, Your Honor.  
4 Those are inside the containment and they certainly  
5 are.

6 JUDGE KARLIN: Okay. Would it include  
7 lines or pipes, underground lines or pipes, that might  
8 carry radioactive liquid wastes?

9 MR. BAGCHI: Yes, Your Honor. In some of  
10 the designs, there are not pipes coming out.

11 JUDGE KARLIN: Okay. All right. If there  
12 are pipes.

13 MR. BAGCHI: Yes.

14 JUDGE KARLIN: I'm not saying that there  
15 always will be. Would they cover just those pipes  
16 that are inside of the safety systems, structures and  
17 components or would they cover ones that would go out  
18 to the lake, let's say? I'm just saying, trying to  
19 understand, this definition.

20 MR. BAGCHI: I'm trying to understand the  
21 scope of your questions so I can answer it  
22 appropriately.

23 JUDGE KARLIN: Good. If it's not clear,  
24 let me know.

25 MR. BAGCHI: My recollection is that it

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1 does not go beyond the rad waste building.

2 JUDGE KARLIN: Okay. I guess what this  
3 indicates is we probably need to read that reg. guide  
4 relatively carefully, this Board, to understand the  
5 meaning of that phrase in this proposed permit  
6 condition.

7 MR. BAGCHI: When I reviewed 2.4.13,  
8 that's the hydrology section related to which this  
9 permit condition was generated. Our focus entirely  
10 was radioactive waste liquid effluent accidental  
11 release.

12 JUDGE KARLIN: When you say 2.14 do you  
13 mean --

14 MR. BAGCHI: 2.4.13.

15 JUDGE KARLIN: Of the environmental --

16 MR. BAGCHI: SER, safety evaluation  
17 report.

18 JUDGE KARLIN: All right. That's helpful  
19 with regard to the introductory phrase, "radioactive  
20 waste management systems, structures and components as  
21 defined in Reg. Guide 1.143." But I'd like to focus  
22 back again on the "accidental" which again what does  
23 accidental mean to you? What is the intent of the  
24 staff with regard to that word in this proposed  
25 condition? Accidental, does it include slow,

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1 undetected leaks into the ground, soil, groundwater?

2 MR. BAGCHI: My understanding is that it  
3 was not to include such leakages.

4 JUDGE KARLIN: Okay. That's --

5 MR. BAGCHI: There would be accidental  
6 releases what I understood.

7 JUDGE KARLIN: And what do you mean -- I  
8 understand this is not a design basis accident  
9 accidental release. We clarified that yesterday, but  
10 what do you mean by accidental in this phrase?

11 Mr. BAGCHI: Failure of a tank. Failure  
12 of a pipe. Some accident causes a puncture or a hole  
13 somewhere.

14 JUDGE COLE: But as this permit condition  
15 was originally written, it pertained only to in your  
16 view to the rad waste handling facility.

17 MR. BAGCHI: Yes, Your Honor.

18 JUDGE COLE: And the way it's currently  
19 written in the proposed permit that spells that out  
20 more clearly.

21 MR. BAGCHI: That is my understanding,  
22 Your Honor. The scope of what's included.

23 JUDGE ELLEMAN: In formulating Permit  
24 Condition 4, you had a particular intended end result.  
25 That end result has now been modified in some sense by

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1 the Commission clarification. Has that modification  
2 in any way compromised what you intended to happen by  
3 your original Permit Condition 4?

4 MR. BAGCHI: No, Your Honor, I don't think  
5 so.

6 JUDGE KARLIN: I'm going to go back to  
7 accidental. Sorry. I think you've answered my  
8 question. You said -- I asked you what did you intend  
9 by the word "accidental releases." And you said,  
10 failure of a tank, failure of a line, puncture of a  
11 tank or a line. Again, failure, let's focus on that  
12 failure. Sudden failure or slow leak, does that  
13 include slow leaks that are not detected or are you  
14 just talking about sudden events? You know, boom, it  
15 fails. Does accident include slow leaks in your  
16 intent here?

17 MR. BAGCHI: In my intent, the accident  
18 was somewhat dynamic. It is not -- I did not envision  
19 slow leak to be a problem. In the hydrological review  
20 context, there are spillages like that. They can be  
21 indicated and potential mitigating measures could be  
22 taken to further arrest propagation and exacerbation  
23 on unacceptable conditions.

24 JUDGE KARLIN: So you're referring to  
25 something where there was a spillage or event where

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1 remedial responses can be taken to mitigate.

2 MR. BAGCHI: Yes, Your Honor.

3 JUDGE KARLIN: I don't mean to focus  
4 solely on, Mr. Bagchi. I don't know who was the  
5 actual other than the legal department. Helping you  
6 perhaps was the person who worked with particular  
7 permit condition and developed it. But are there any  
8 of the other witnesses care to address what the  
9 staff's intent is when you adopted this language  
10 "accidental releases"? Who is the right person to  
11 ask?

12 MR. BAGCHI: This review concept came from  
13 the very title of Section 2.4.13 of Hydrology. It has  
14 been there for many years and the terminology used  
15 there is accidental and I was assisted in my review  
16 with respect to groundwater pathway characterization  
17 and groundwater movement characterization by Mr. Vail  
18 from Pacific Northwest National Laboratory. So the  
19 primary concept came from the two of us.

20 JUDGE KARLIN: Okay. Let's go to that  
21 section then, if we could, of the FSER.

22 JUDGE COLE: Could you give a page number?

23 JUDGE KARLIN: It's page 2.128.

24 MR. BAGCHI: I can give it to you now.

25 JUDGE KARLIN: No, my colleagues needed

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1 some help. I know you have it memorized. So do you  
2 have it there, sir?

3 MR. BAGCHI: Yes, Your Honor.

4 JUDGE KARLIN: Okay. And I'm reading from  
5 2.1.28. I read the quote. "In the SSAR Section  
6 2.4.13, the Applicant stated that all analysis of  
7 accidental releases to ground and surface waters  
8 should be deferred to the COL stage. However,  
9 pursuant 10 CFR 52.17 and 10 CFR 100-20-C3, the  
10 Applicant is required at the ESP to obtain factors for  
11 applicable hydrology radionuclide release pathways for  
12 a site-specific suitability determination." So I  
13 guess the Applicant wanted to postpone the issue until  
14 later. Is that what that's saying?

15 MR. BAGCHI: Yes, Your Honor.

16 JUDGE KARLIN: And you noted that the  
17 regs. require it to sought to be addressed now. So  
18 how did you decide to address it? Was that Permit  
19 Condition 4 your response in a way to address this  
20 problem?

21 MR. BAGCHI: Ultimately it was. Yes, Your  
22 Honor.

23 JUDGE KARLIN: All right. Okay. And when  
24 I ask you what is the meaning or what was your intent  
25 with regard to accidental releases you're just saying

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1 it came from the title for this section of the final  
2 safety evaluation report.

3 MR. BAGCHI: Yes, Your Honor. It came  
4 from the standard review plan as well.

5 JUDGE KARLIN: Standard review plan.

6 MR. BAGCHI: And from Regulatory Guide  
7 1.70 which was an initiating point aside from ours  
8 which also came from Reg. Guide 1.70 anyway.

9 JUDGE KARLIN: Okay. All right. I think  
10 you've helped clarify the universal of systems or  
11 equipment that are covered by the first phrase in the  
12 proposed Permit Condition 4. Radioactive waste  
13 management systems, structures and components as  
14 defined in Reg. Guide 1.143" that excludes spent fuel  
15 pools. It covers a number of things and for further  
16 guidance we just have to look at that reg. guide.  
17 That's helpful.

18 You've also, I think, helped us a little  
19 bit with what's covered by the word "accidental." Now  
20 I want to focus on the phrase "features to preclude  
21 accidental releases." As I understand this clause, it  
22 says that the Applicant must include the design of the  
23 reactor, future design, future reactor. Must include  
24 features to preclude accidental releases. What would  
25 those features be? Can you talk about what kind of

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1 features you contemplate?

2 MR. BAGCHI: The preclusion concept was  
3 based on engineer design, design, construction and  
4 inspection features that can render accidental  
5 releases highly unlikely. This may include monitors,  
6 alarms, in-service inspection features.

7 JUDGE KARLIN: Wait a second. Monitors  
8 and alarms, what would they do?

9 MR. BAGCHI: They would indicate that  
10 there has been some kind of a collection of material  
11 that should not be there. Therefore, they should be  
12 investigated or whatever. Monitors do --

13 JUDGE KARLIN: Are they after the fact?  
14 Did they tell you that there has been a release and  
15 then they alarm and issue a monitor and say, "Oh,  
16 we've had a release"?

17 MR. BAGCHI: Your Honor, these monitors  
18 can be designed and fashioned for several purposes.  
19 For example, it could be in an area where there is a  
20 containment concept around a tank where there is a  
21 liquid that has come out. So the alarm would indicate  
22 that there is this location. There has been some  
23 unexpected presence of radioactive nuclear effluent.

24 JUDGE COLE: Like a leaking valve.

25 MR. BAGCHI: Like an leaking value or

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1           however one designs that.

2                       JUDGE KARLIN:       Some alarms in the  
3           petroleum industry for example, there are double hold  
4           tanks, underground tanks, that are sometimes used.  
5           Now if a leak from the inside layer of the tank goes  
6           into the second layer an alarm can go off and inform  
7           the operators before the material is released into the  
8           soil into the environment. There are other alarms  
9           that are in the environment and don't prevent releases  
10          or preclude them. They just simply tell you there's  
11          been one. Which one do you mean?

12                      MR. BAGCHI: These would be very similar.  
13          They could serve purposes because tritium can come out  
14          of the liquid and I'm pretty sure Reg. Guide 1.143  
15          would require something in the rad waste building  
16          itself for that.

17                      JUDGE KARLIN: I'm just suggesting that  
18          alarms that tell you that there has been a release do  
19          not serve to preclude releases. They just tell you  
20          there's been one. So I wouldn't think those qualify  
21          as alarms that preclude releases. Those are alarms  
22          that tell you there's already been one. The horse is  
23          already out of the barn door.

24                      MR. BAGCHI: Yes, Your Honor. Those would  
25          be for remedial action.

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1 JUDGE KARLIN: Right. So there are some  
2 features that can be done to preclude releases.

3 MR. BAGCHI: Yes and these would be guard  
4 pipes.

5 JUDGE KARLIN: Double-shelled tanks?

6 MR. BAGCHI: Tanks could be double-  
7 shelled. Most of these tanks are over ground or are  
8 on base mats.

9 JUDGE KARLIN: Now let me ask this. In  
10 the Commission's September 2006 report on lessons  
11 learned from tritium, I believe one of the concerns  
12 raised was that some of the waste water treatment  
13 equipment is designed to commercial standards rather  
14 than nuclear standards. Do you recollect that?

15 MR. BAGCHI: Yes, Your Honor.

16 JUDGE KARLIN: Are one of the features  
17 you're suggesting that would be required by this would  
18 be to design some of these tanks to nuclear standards  
19 as opposed to just normal commercial tank standards or  
20 maybe they already are? I don't know.

21 MR. BAGCHI: Your Honor, Regulatory Guide  
22 1.143 goes into very substantial details about the  
23 standards that are applied, ASME standards that are  
24 applied. There are classifications of different  
25 categories of systems and components.

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1 JUDGE KARLIN: Right, but was that guide  
2 written after the lessons learned of September 2006 or  
3 before?

4 MR. BAGCHI: No, it was before those. In  
5 2001, it was written at that time.

6 JUDGE KARLIN: But I thought the lessons  
7 learned was maybe some higher standards might be  
8 appropriate to help preclude such releases.

9 MR. BAGCHI: Your Honor, I know of no  
10 standard that's higher than the ASME standard in  
11 accordance with appropriate quality even \*\*\* 9:28:47  
12 is governed by ASME Class 1.

13 JUDGE COLE: Well, is that Reg. Guide  
14 1.143? Is that what the standard --

15 MR. BAGCHI: It has different categories  
16 of standards that apply to different classes of  
17 components. If your question is related to whether or  
18 not those existing plants met the quality  
19 requirements, I am not going to --

20 JUDGE COLE: How did the ASME standard  
21 come into play?

22 MR. BAGCHI: Because the Reg. Guide 1.143  
23 has some criteria related to that.

24 JUDGE COLE: Okay. Thank you.

25 JUDGE KARLIN: But my concern is that the

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1 Commission's September 2006 lessons learned from the  
2 inadvertent and slow releases of tritium said despite  
3 the fact that these various reactors were complying  
4 with all of the regulatory requirements including, I  
5 presume, the reg. guide you just cited, despite that  
6 fact, there have been releases of concern to us and  
7 therefore we are recommending that it be considered to  
8 preclude such releases in the future may be higher and  
9 tougher standards should be applied by the staff in  
10 its discretion or by perhaps the Agency ultimately in  
11 a regulation for some of this equipment. Is that what  
12 you're intending when you say "include features to  
13 preclude it"?

14 MR. BAGCHI: No, Your Honor.

15 JUDGE KARLIN: No.

16 MR. BAGCHI: There are more protective  
17 devices that could be put in there. Guard pipes don't  
18 exist there.

19 JUDGE KARLIN: Okay. All right. Now  
20 looking at the clause "include features to preclude  
21 accidental releases," let's say I'm Dominion and I  
22 read that and I take it seriously as I expect they  
23 will and they impose the kind of features that you've  
24 just described or thought about and let's say despite  
25 that including features to preclude accidental

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1 releases, they have accidental releases. It happens.  
2 Would that be a violation of this permit condition?  
3 Would they be in violation of the law, the regs. or  
4 this permit if they had such releases?

5 MR. BAGCHI: In my mind, it would.

6 JUDGE KARLIN: Mr. Dehmel.

7 MR. DEHMEL: Yes.

8 JUDGE KARLIN: That wasn't the answer I  
9 was looking for, but all right.

10 MR. DEHMEL: I'm too sure what the permit  
11 condition for sure because I think this is a licensing  
12 issue. But with respect to the effluent to the  
13 environment, it would be what's called an unmonitored,  
14 uncontrolled release.

15 JUDGE KARLIN: Right. Okay.

16 MR. DEHMEL: And therefore depending how  
17 much radioactivity leaked, what was the endpoint of  
18 that containment, whether or not it would impact an  
19 outside dose receptor, they would have to determine  
20 what the impact was and report it to the NRC and  
21 whether or not the trip involved the Appendix I  
22 requirement and whether or not the trip involved 10  
23 CFR Part 20.

24 JUDGE KARLIN: Right.

25 MR. DEHMEL: So in that context, there may

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1 be some regulatory penalties associated with that  
2 depending on whether or not they failed their own  
3 procedure.

4 JUDGE KARLIN: Right.

5 MR. DEHMEL: Whether or not they failed to  
6 meet the Appendix I requirement and ultimately it's  
7 whether or not they failed to comply with Part 20.

8 JUDGE KARLIN: Right. Well, I'm focusing  
9 -- I understand that. Let's assume for the moment  
10 that the this permit condition into the ESP. It's  
11 incorporated, let's say, into the COL. The reactor is  
12 built. That's the general operating assumption here  
13 and they, in fact, comply with or they, in fact, build  
14 the reactor that includes features to preclude  
15 accidental releases of radionuclides. They have a  
16 reactor which includes features to preclude  
17 radionuclide releases and yet a radionuclide release  
18 occurs. It doesn't exceed the regulatory standard.  
19 It doesn't violate the regulations. It doesn't  
20 violate the statute. Does it violate this permit  
21 condition? Does it violate this permit condition if  
22 they have a release?

23 MR. WEISMAN: Excuse me, Your Honor. I  
24 guess -- This is Bob Weisman from the staff and I  
25 think this is really a legal question.

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1 JUDGE KARLIN: I appreciate that, but  
2 these are the people who I take the ropes at permit  
3 condition and therefore I'd like to know what their  
4 intent is and, yes, I agree it's a legal condition at  
5 the end of the day. But as the staff who have written  
6 this permit condition and then would presumably  
7 enforce this permit condition, I would like to  
8 understand what their intent is as to whether or not  
9 they think that would violate this permit condition.

10 MR. WEISMAN: Of course, Your Honor. With  
11 all due respect, the staff are not legal experts and  
12 they are not expert on what is the legal effect of the  
13 condition.

14 JUDGE KARLIN: Right. Very good. I  
15 absolutely agree with you there. I'm just asking for  
16 their intent. So is it your intent that under the  
17 circumstances I described that you would consider  
18 that, and maybe I'll focus on Mr. Dehmel because Mr.  
19 Bagchi already answered. Is it your intent that that  
20 would be a violation of this permit condition?

21 MR. DEHMEL: I can only speak to the  
22 effluent control requirements under Part 20. That's  
23 all I can.

24 JUDGE KARLIN: All right. That's not the  
25 issue. Okay. Let me put it this way. I am concerned

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1 that would not be a violation of this permit condition  
2 that contrary to what Mr. Bagchi says. It seems to me  
3 if I parse those words carefully enough and I find Mr.  
4 Lewis, a good attorney, defending my company and if  
5 the day would come when I would have releases,  
6 accidental releases, from the system and it did get  
7 into the ground, detected or undetected, at the end of  
8 the day I would say "Hey, I built that facility. It  
9 has features to preclude accidental releases. I never  
10 guaranteed there wouldn't be any. So don't say I'm in  
11 violation if they happen." Okay.

12 Now let me ask. Under NEPA, I wanted to  
13 ask, as I understand NEPA requires that the Agency,  
14 the NRC, do an analysis of the environmental impacts,  
15 do an environmental impact statement. Is that  
16 correct, Mr. Bagchi?

17 MR. BAGCHI: Your Honor, I take no  
18 cognizance of NEPA regulations. It's not in my area.  
19 I did not review that. Dr. Dehmel maybe is qualified  
20 to answer that.

21 JUDGE KARLIN: All right. Well, this is  
22 about the zero release commitment and so we have some  
23 NEPA related questions. Is there anyone on this  
24 panel? Let me just anyone on this panel. Does NEPA  
25 require that you do an EIS? Mr. Vail, do you know the

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1 answer to that?

2 MR. VAIL: I'm not a NEPA expert either.

3 JUDGE KARLIN: Okay. Then let me ask  
4 this. Does the FEIS analyze the impact of groundwater  
5 contamination from releases from this system? Where  
6 in the EIS are groundwater impacts covered?

7 MR. STOETZEL: We covered the -- Under the  
8 normal impacts from normal releases from rad releases,  
9 we evaluated the Licensee's or the radiological  
10 environmental monitoring program and we looked at data  
11 from that to get the impact on the potential impacts  
12 from releases onsite from the plant.

13 JUDGE KARLIN: Okay. Now here is the way  
14 I approach it. I mean, NEPA requires an environmental  
15 impact statement. The environmental impact statement  
16 is supposed to cover environmental impacts to the  
17 relevant media. One of the relevant medium is  
18 groundwater. I'm then concerned about whether the  
19 environmental impact statement analyzed and discussed  
20 the impacts of this facility on groundwater and soil  
21 and so can you point me to the section of the FEIS  
22 that covers the impacts, the operation of this  
23 facility to groundwater? I'm not trying to trick  
24 anybody.

25 MR. STOETZEL: I know.

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1 JUDGE KARLIN: I actually did have a hard  
2 time.

3 MR. STOETZEL: We looked at the  
4 environmental operating report and looked at the well.  
5 There was one well onsite. We looked at that data and  
6 based on that, there was no impact from -- there were  
7 no rad levels, no tritium levels or any indication of  
8 radioactivity in that one well.

9 JUDGE KARLIN: Right and that was of the  
10 existing site.

11 MR. STOETZEL: Right.

12 JUDGE KARLIN: The well was talked about  
13 yesterday.

14 MR. STOETZEL: So based on that and the  
15 fact that the gradient was toward the lake, we had no  
16 indication that there would be any need to evaluate  
17 the groundwater pathway.

18 JUDGE KARLIN: I'm looking at page 5.59 of  
19 the environmental impact statement. Do you all have  
20 that?

21 MR. STOETZEL: I don't have that with me.

22 JUDGE KARLIN: At 5.59 and 5.58, there is  
23 a radiological health impacts analysis. Section 5 if  
24 I understand you correctly is operational impacts at  
25 the proposed site. That's the general topic, right?

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1 MR. STOETZEL: That's correct.

2 JUDGE KARLIN: So I figured somewhere in  
3 there would be the impacts to groundwater of the  
4 operation of the proposed site and this is one  
5 possibility. There's a liquid effluent pathway  
6 discussion at 5.9.2.1. I see a little discussion of  
7 tritium there.

8 MR. STOETZEL: That's correct. We did  
9 rely -- In my presentation yesterday, there was a  
10 slide that indicated that there really isn't any way  
11 to predict what would be released or in these  
12 inadvertent situations what the activity would be.  
13 It's kind of like how would you know that particular  
14 source term was in that situation and I think that's  
15 also indicated in the task force report on the liquid  
16 release task force by the NRC from September of '06.

17 JUDGE KARLIN: Okay.

18 MR. STOETZEL: So there's not way to  
19 really know, to determine, a source term for that and  
20 also in my presentation yesterday, I noted that we did  
21 rely on this permit condition. That was mentioned in  
22 the presentation and also the fact that there would be  
23 no -- That the design was not -- There is no design to  
24 really evaluate and determine the impacts. I think  
25 there is no design of the rad waste system.

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1 JUDGE KARLIN: Yes. It seems -- Please.  
2 I'm going to make a statement and ask your thoughts on  
3 that. It seems to me that the final environmental  
4 impact statement does not address impacts to  
5 groundwater because there is Permit Condition 4 which  
6 would preclude or would require the inclusion of  
7 features that would preclude any releases, accidental  
8 releases, to groundwater. So you decided not to cover  
9 it?

10 MR. STOETZEL: That's part of it and then  
11 part of it is the fact that we saw no indication of  
12 contamination in the groundwater from the existing  
13 unit distancing plants.

14 JUDGE KARLIN: But weren't you aware of  
15 the fact that over the previous year there had been  
16 quite a bit publicity about, for example, tritium  
17 groundwater impacts of a number of reactors all over  
18 the United States?

19 MR. STOETZEL: Yes, we were --

20 JUDGE KARLIN: So simply because you --  
21 And the one well that you have here is one well is up  
22 gradient. It's not going to catch anything anyway.  
23 Is that why you didn't look to groundwater impacts?  
24 I mean -- I think I've gotten an answer that I was  
25 concerned about. I think that's all the questions I

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1 have. Dr. Elleman, I think you have --

2 JUDGE ELLEMAN: Let me ask just a couple  
3 if I may. Permit Condition 4 speaks in terms of  
4 precluding. I have not checked this with a dictionary  
5 but I think of prevent and preclude as being synonyms.  
6 Is that true? Could I substitute prevent for preclude  
7 and it still be a correct statement?

8 MR. BAGCHI: The way I looked at it, Your  
9 Honor, they would be synonymous.

10 JUDGE ELLEMAN: Synonymous. Okay. So  
11 we're going to stop these things from happening  
12 through the design. It's been mentioned that in the  
13 Clinton and Grand Gulf case there was considerable  
14 discussion on this issue and I believe at one point  
15 they even attempted to impose requirements in terms of  
16 what the pressure gradients should be in systems so  
17 that flow would be inward into structures rather  
18 outward into soil. Did the discussions and points  
19 made in those hearings in any way impact or alter the  
20 staff position on this particular issue? And if they  
21 did, how did they alter it? I would open this to all  
22 of you on the panel to address.

23 MR. BAGCHI: A clarification at first,  
24 Your Honor. Were you thinking about the hydraulic  
25 gradient kind of issue that came up in Clinton for

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1 example? That's a separate permit condition not quite  
2 related to this.

3 JUDGE ELLEMAN: No, I'm thinking in terms  
4 of the radioisotopic release into soil and transport  
5 within the soil and that's the focus of my question.  
6 That was a part of their concern in what they address.

7 MR. BAGCHI: Now clearly there are system  
8 designs that can prevent any leakage outside pipes and  
9 systems that are designed that way. However, I was  
10 all three, including this one, I was at all two of  
11 those hearings as who are witness and I do not recall  
12 a discussion about design features that would require  
13 a negative pressure to be maintained in the rad waste  
14 treatment system.

15 JUDGE ELLEMAN: I didn't bring those with  
16 me. So I can't pull them out and produce the  
17 sentences I'm referring to. But my question was has  
18 your perception of this issues altered in any way as  
19 a result of the issues they raise in those hearings.

20 MR. BAGCHI: Your Honor, no.

21 JUDGE ELLEMAN: Okay. We as mentioned  
22 earlier have put out a number of questions at various  
23 times and the answer to one of those questions  
24 resonated particularly with me and it was in response  
25 to Question E-62, Part A which was an environmental

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1 question and it related to leaks of radioactive  
2 material which is what Judge Karlin has been  
3 addressing and let me read the exact response, part of  
4 the exact response to that question.

5 JUDGE KARLIN: And this is the staff's  
6 response.

7 JUDGE ELLEMAN: Yes, this is a staff  
8 statement. "Systems or structures can experience  
9 undetected radioactive leaks over a prolonged period  
10 of time. Systems are structures that are buried or  
11 that are in contact with soil such as spent fuel  
12 pools, tanks in contact with the ground and buried  
13 pipes, are particularly susceptible to undetected  
14 leakage." And that resonated with me because in the  
15 six years I spent hanging out with nuclear power  
16 plants, these things happen and they happen at all  
17 four of the plants I was involved with. Do you  
18 believe that to be a statement of the staff view on  
19 this statement, what I read?

20 MR. BAGCHI: I completely agree with that  
21 statement, Your Honor.

22 JUDGE ELLEMAN: Okay. Well, now given  
23 that statement, does this not make you question the  
24 possibility of being able to design and build a system  
25 that isn't going to leak?

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1 MR. BAGCHI: Very attractive concept, Your  
2 Honor. I had not thought about that. The existing  
3 containment at Units 1 and 2 does work somewhat in  
4 that principle. It is a subatmospheric containment.

5 JUDGE ELLEMAN: Yes, you can lower the  
6 possibility. You can probably lower the consequences,  
7 but can you really -- I'd enjoy hearing from all four  
8 of you on this point. I would like to hear from the  
9 person who believes it is possible to design and build  
10 a system that you can put your life on the line and  
11 say that system isn't going to leak. Anybody?

12 MR. DEHMEL: Operationally speaking,  
13 health physicists are always called when there's a  
14 leak.

15 JUDGE ELLEMAN: Yes. Okay.

16 JUDGE KARLIN: Let the record reflect  
17 silence.

18 JUDGE ELLEMAN: Right. Nobody's speaking.  
19 I guess I maybe don't know where else to go then on  
20 this point. Okay.

21 MR. BAGCHI: Your Honor, I just provide  
22 you with an answer which is a best estimate of  
23 protection of public health and safety, the  
24 containment is subatmospheric.

25 JUDGE ELLEMAN: I'm sorry. What?

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1 MR. BAGCHI: Units 1 and 2 containments  
2 are subatmospheric.

3 JUDGE ELLEMAN: Okay. So you have a  
4 pressure gradient that is going to make the flow in a  
5 safe direction is what you're saying.

6 MR. BAGCHI: Yes, Your Honor.

7 JUDGE ELLEMAN: Okay. That's  
8 acknowledged. I have no further questions.

9 JUDGE KARLIN: Okay. All right. I think  
10 are there any clarification questions fro the staff?

11 MR. WEISMAN: Yes, Your Honor.

12 JUDGE KARLIN: Great. Okay.

13 MR. WEISMAN: Bob Weisman for the staff.  
14 I have the legal on this.

15 JUDGE KARLIN: Finally putting you to work  
16 on this one instead of Ms. Poole.

17 MR. WEISMAN: Yes.

18 JUDGE KARLIN: Or you haven't delegated  
19 that one.

20 MR. WEISMAN: So I guess I just have a few  
21 questions for the panel and the first one is so Reg.  
22 Guide 1.143 systems, those are rad waste systems.

23 MR. BAGCHI: That is my understanding.

24 MR. WEISMAN: These rad waste systems, are  
25 those safety related systems?

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1 MR. BAGCHI: Various categories of safety.  
2 There is distinction between different systems in that  
3 regulatory guide.

4 MR. WEISMAN: Okay. So some of them are  
5 safety related and subject to Appendix B and some are  
6 not.

7 MR. BAGCHI: That's correct.

8 MR. WEISMAN: So those that are safety  
9 related, do they have a design basis accident  
10 associated with them? Is there a design for that?

11 MR. BAGCHI: Yes, they are.

12 MR. WEISMAN: In this license condition,  
13 it appears to the safety related systems as well as  
14 the ones that are not safety related. Is that  
15 correct?

16 MR. BAGCHI: That's correct.

17 MR. WEISMAN: Is the spent fuel pool  
18 safety related?

19 MR. BAGCHI: Yes.

20 MR. WEISMAN: And it's designed for a  
21 design basis accident.

22 MR. BAGCHI: Yes, indeed.

23 MR. WEISMAN: And are those design basis  
24 accidents, are they bounding for lesser accidents for  
25 those safety related systems?

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1 MR. BAGCHI: I'm not going to try to  
2 interpret what those words might mean.

3 MR. WEISMAN: All right.

4 MR. BAGCHI: In a structural sense.  
5 That's said, the design basis accidents are bounding.

6 MR. WEISMAN: Okay.

7 MR. BAGCHI: And they do combine normal  
8 operating loads as well.

9 MR. WEISMAN: And I guess in the same  
10 vein, but also including the nonsafety related system,  
11 if there is a design feature that would prevent  
12 leakage from such an event as a sudden tank failure,  
13 for example, would that design feature also prevent  
14 slow leakage from that system?

15 MR. BAGCHI: Please state it one more  
16 time.

17 MR. WEISMAN: If a design feature would  
18 prevent leakage from a sudden tank failure, for  
19 example, or a pipe failure, for example, would that  
20 design feature also prevent slow leakage from the tank  
21 or the pipe?

22 MR. BAGCHI: The design feature itself  
23 most of the time they would, but they might not.  
24 That's why in service inspection it's associated with  
25 safety related systems.

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1 MR. WEISMAN: I think that's all I have,  
2 Your Honor.

3 JUDGE KARLIN: Okay. Thank you. And I  
4 see you've put the regs. to good use having a little  
5 stand for your microphone.

6 MR. WEISMAN: They have to be used for  
7 something.

8 (Laughter.)

9 JUDGE KARLIN: Yes. We have piles of  
10 them. All right. I think with that we will thank  
11 this panel and rather than taking a break, we're  
12 fresh, relatively fresh, why don't we just convene the  
13 next panel. Thank you. You all may step down.

14 (Panel dismissed.)

15 JUDGE KARLIN: All right. Mr. Biggins,  
16 you seemed to have lost -- There's Ms. Poole. You  
17 have your slides. Okay.

18 MS. POOLE: I apologize, Your Honor.

19 JUDGE KARLIN: Yes, the computers. Okay.  
20 Are we ready to proceed?

21 MS. POOLE: Yes, Your Honor.

22 JUDGE KARLIN: All right. Great. Dr.  
23 Munson, I see you're standing. Please raise your  
24 right hand.

25 WHEREUPON,

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1 CLIFFORD MUNSON

2 was called as a witness, and having been first duly  
3 sworn, was examined and testified as follows:

4 JUDGE KARLIN: Okay. Thank you. Please  
5 sit down.

6 DR. MUNSON: Your Honors, I have a brief  
7 presentation and then afterwards I'll welcome your  
8 questions.

9 JUDGE KARLIN: All right.

10 DR. MUNSON: I am Dr. Clifford Munson of  
11 the Office of New Reactors and I was the principal  
12 reviewer of the geology, seismology and geotechnical  
13 engineering portions of the North Anna ESP  
14 application. My background is in geophysics,  
15 seismology and I've worked for the NRC for 11 years.  
16 Slide 2 please.

17 That's me. I will first cover the  
18 applicable regulations and regulatory guidance. Next  
19 I will describe the staff's review of the regional and  
20 site geology, the vibratory ground motion.

21 JUDGE KARLIN: Let me just pause for a  
22 moment here. Okay. Slide 2, I want to make sure I'm  
23 on the same page you are. Okay. Slide 2. Please  
24 proceed.

25 DR. MUNSON: Okay. And the site

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1 subsurface materials. Finally, I will cover the  
2 staff's main conclusions in these three areas.

3 Slide 3, 10 CFR 100.23 describes the  
4 geologic and seismic sitings criteria. 10 CFR 100.23  
5 specifies a probabilistic approach to seismic hazard  
6 characterization and was developed in the mid 1990s to  
7 replace the older deterministic approach.

8 Part C of 10 CFR 100.23 requires an  
9 evaluation of the geological, seismological and  
10 engineering characteristics of the site and region.  
11 Part D of 10 CFR 100.23 requires the determination of  
12 the safe shutdown earthquake ground motion or SSE. In  
13 addition, paragraph 1 of Part D requires that the  
14 uncertainties inherent in the seismic hazard estimates  
15 be addressed through an appropriate analysis such as  
16 probabilistic seismic hazard analysis or suitable  
17 sensitivity analysis. Finally, Part D of 10 CFR  
18 100.23 requires the determination of the potential  
19 first surface deformation at the site.

20 Guidance for meeting 10 CFR 100.23 is  
21 provided in Regulatory Guide 1.165 which is entitled  
22 "Identification and Characterization of Seismic  
23 Sources and Determination of Safety Shutdown  
24 Earthquake Ground Motion." Regulatory Guide 1.165 was  
25 developed simultaneously with 10 CFR 100.23 in the mid

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1 1990s and it describes the necessary regional and site  
2 investigations. It provides direction on the  
3 probabilistic seismic hazard approach and it provides  
4 the steps for determining the site SSE.

5 In addition to Regulatory Guide 1.165,  
6 three other regulatory guides used in the geotechnical  
7 engineering area are Regulatory Guides 1.132, 1.138  
8 and 1.198. These regulatory guides specify the field  
9 explorations and laboratory work necessary to identify  
10 the soil and ground engineering properties and their  
11 stability.

12 Slide 5. Rather than characterizing the  
13 seismic potential at each identified geologic feature,  
14 the Applicant used aerial source zones which were  
15 developed in the early 1990s for the entire Central  
16 and Eastern United States by the Electric Power  
17 Research Institute or EPRI. This type of approach is  
18 recommended in Regulatory Guide 1.165. In addition,  
19 Regulatory Guide 1.165 also specifies that detailed  
20 regional and local geologic investigations be  
21 conducted to determine if there are potentially any  
22 new sources or previously identified sources needed to  
23 be updated.

24 To address this issue, the staff probed  
25 the Applicant's characterization of several regional

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1 and local faults, including the Mountain Run, Stafford  
2 and Seven Fall Lines. They staff and its consultants,  
3 the U.S. Geological Survey --

4 JUDGE KARLIN: Let me ask. When you say  
5 "the staff" do you mean you?

6 DR. MUNSON: In this --

7 JUDGE KARLIN: I mean you're sitting here  
8 all alone. This is the first panel like that.

9 DR. MUNSON: I was the principal reviewer.  
10 I did the assistance of a geotechnical engineer who  
11 has since retired from the NRC. But I wrote all 120  
12 pages of the SER. So --

13 JUDGE KARLIN: So you're responsible. Mr.  
14 Dehmel back there he wrote three pages. 120 pages.

15 MR. DEHMEL: Six, Your Honor.

16 JUDGE KARLIN: Six.

17 (Laughter.)

18 JUDGE KARLIN: I stand corrected.

19 JUDGE COLE: No actually it was nine  
20 because there were six in the supplemental materials.

21 DR. MUNSON: So we assist from the U.S.  
22 Geological Survey. We had two geologists from the  
23 U.S. Geological Survey and a geophysicists also that  
24 assisted me in my review. So we reviewed the  
25 Applicant's arguments with these local geologic

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1 features and visited the site to confirm the  
2 Applicant's conclusions. In addition to those  
3 specific faults, the staff reviewed the aerial source  
4 zones defined by the Applicant. These sources zones  
5 were each assigned a maximum magnitude range, a  
6 recurrence and a geographic area. Examples of the  
7 aerial source zones defined by the Applicant include  
8 the Central Virginia seismic zones, the East Coast  
9 fault system and the Charleston, South Carolina.

10 JUDGE COLE: These are all zones that you  
11 identified with similar seismic characteristics.

12 DR. MUNSON: That's correct.

13 JUDGE COLE: That's why you put it in  
14 zones.

15 DR. MUNSON: Right. That's correct, Your  
16 Honor.

17 Slide 6. The staff also focused on the  
18 Applicant's characterization of an unnamed Fault A.  
19 This fault traverses the site and was discovered  
20 during excavation of abandoned units 3 and 4. After  
21 intensive study in the 1970s by Virginia Electric and  
22 Power Company and its consultants as well as the staff  
23 and its consultants, the U.S. Geological Survey,  
24 unnamed Fault A was determined by the staff and the  
25 Licensee to be an inactive Paleozoic fault.

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1                   Specifically, the staff concluded in its  
2 SER that the fault is not capable which means that  
3 there has been no reoccurring movement on the fault in  
4 the past 500,000 years. This was determined by VEPCO  
5 through radiometric aiding, trenching and an  
6 examination of local seismicity. During its review of  
7 the North Anna ESP application, the staff confirmed  
8 that its earlier conclusions regarding this fault  
9 remain valid.

10                   Slide 7. To estimate the vibratory ground  
11 motion at the ESP site from each of the seismic  
12 sources, the Applicant used a probabilistic approach  
13 recommended in Regulatory Guide 1.165. The staff  
14 reviewed the probabilistic approach used by the  
15 Applicant, in particular, the Applicant's updates of  
16 the regional seismic source zones and current ground  
17 motion models. The staff also verified the adequacy  
18 of the dominant or controlling earthquakes for the  
19 site. These are generally a local and distinct  
20 earthquake that contribute the most to the overall  
21 seismic hazard. From the North Anna ESP site, the  
22 local, controlling earthquake is a magnitude 5.4 at 12  
23 miles and the distant controlling earthquake is a  
24 magnitude of 7.2 at a distance of 191 miles.

25                   Slide 8. To determine the site SSE, the

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1 Applicant used a revised reference probability value.  
2 The reference probability recommended by Regulatory  
3 Guide 1.165 is  $1 \times 10^{-5}$  per year based on median  
4 seismic hazard curves. The Applicant proposed and  
5 used a reference probability value of  $5 \times 10^{-5}$  per  
6 year based on the use of mean seismic hazard curves.

7 As an illustration of how the reference  
8 probability value is determined, I have a sample SSE.  
9 It's a Regulatory Guide 1.60 SSE and if you look,  
10 there are two frequency values of 5 and 10 Hertz on  
11 this figure and those values, the spectral  
12 acceleration, the SSE at those two frequencies is  
13 first determined.

14 Slide 10. Then those two spectral  
15 acceleration values at 5 and 10 Hertz are matched to  
16 the corresponding seismic hazard curves. From that,  
17 we can determine the annual probability of exceeding  
18 those spectral acceleration values which is the Y axis  
19 on this plot. The average of those two annual  
20 probability of accedences is the reference probability  
21 for that site.

22 This figure on Slide 11 shows the  
23 reference probabilities for 29 Central and Eastern  
24 U.S. sites. That was determined in the early 1990s  
25 and this is a figure from Reg. Guide 1.165. The

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1 composite median value for these 29 sites is the 1 X  
2  $10^{-5}$  value.

3           Going back to Slide 11, since the  
4 reference probabilities of these Central and Eastern  
5 U.S. sites were determined in the early 1990s, new  
6 ground motion models have been developed for the  
7 Central and Eastern United States. In addition,  
8 recurrence values, the interval between large  
9 earthquakes for the New Madrid and the Charleston,  
10 South Carolina earthquake zones have decreased. This  
11 would imply that for some if we were to recalculate  
12 the 20 reference probabilities, some of these might  
13 actually increase slightly so that overall composite  
14 reference probability would be different than this 1  
15 X  $10^{-5}$  value.

16           Back to Slide 8, to review the Applicant's  
17 proposed reference probability, the staff performed an  
18 independent confirmatory analysis. The staff used the  
19 2002 U.S. Geological seismic hazard maps to verify the  
20 overall trend in the hazard for the Central and  
21 Eastern U.S.

22           Proceeding to Slide 12. The staff visited  
23 the North Anna ESP site to observe the geotechnical  
24 field explorations. Once we received the ESP  
25 application, the staff reviewed the properties of the

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1 subsurface soil and rock and verified the adequacy of  
2 the field investigations and laboratory testing. The  
3 staff also confirmed the similarity between the  
4 subsurface material underlying the North Anna Tower  
5 Station and the ESP site.

6 In conclusion, the staff found that the  
7 Applicant provided a thorough characterization of the  
8 regional and local geology and seismology. We found  
9 that the Applicant appropriately characterized the  
10 seismic sources for the safe shutdown earthquake. The  
11 staff concluded that the revised reference probability  
12 adequately reflects the current understanding of  
13 seismic hazard in the Central and Eastern U.S. and the  
14 ESP site is acceptable from a geological and  
15 seismological standpoint and the applicable  
16 regulations have been met.

17 This concludes my formal presentation. I  
18 welcome your questions at this time.

19 JUDGE KARLIN: Okay. Thank you. Dr.  
20 Cole.

21 JUDGE COLE: You answered most of the  
22 questions that the Licensing Board forwarded on  
23 seismic and we've read your answers. It's an  
24 understatement to say the whole situation is a bit  
25 complicated.

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1 DR. MUNSON: Yes, Your Honor.

2 JUDGE COLE: In Question No. 56 in Safety  
3 questions -- Before we get started on that, I would  
4 say that the content of the SER and the answers to  
5 Questions 52 to 54 pretty much are convincing that  
6 there's no capable faults on the site and with that  
7 being a determination then the probability of having  
8 any surface distortion is pretty much eliminated.

9 DR. MUNSON: That is correct.

10 JUDGE COLE: All right. The March 2005  
11 ACRS testimony notes that the site safety shutdown  
12 earthquake exceeds the design site SSE at high  
13 frequencies for the design and the Applicant proposed  
14 to fix for that. Could you describe how he proposed  
15 to fix that?

16 DR. MUNSON: Actually, in the application  
17 itself, the Applicant alluded to what would be  
18 referred to as an engineering design spectrum.

19 JUDGE COLE: Yes.

20 DR. MUNSON: They have not selected a  
21 specific reactor design and as such, we do not have a  
22 design spectrum to compare the site spectrum to at  
23 this time. So we cannot say that they're going to  
24 exceed -- The site SSE will exceed a design, a  
25 postulated design, because they haven't selected a

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1 design yet.

2 JUDGE COLE: But did they give you an  
3 envelope. That's the whole point. They don't know  
4 the design, but there should be a plant parameter  
5 envelope, a parameter on that.

6 DR. MUNSON: For the site for this area,  
7 for the SSE, there's a site characteristic which is  
8 defined as the SSE, the specific site SSE determined  
9 by the regional and local geologic hazard.

10 JUDGE COLE: But you were saying they  
11 didn't select the design and therefore you could do  
12 some things. Don't they give you a parameter envelope  
13 --

14 DR. MUNSON: At the --

15 JUDGE COLE: Yes, that's the whole point.  
16 They haven't selected a design but they're supposed to  
17 give a PPE that would cover all the spectrum of  
18 potential designs they might be considering.

19 JUDGE KARLIN: You're saying that since  
20 they didn't have enough information the staff couldn't  
21 pass judgment on whether that procedure would pass  
22 muster.

23 DR. MUNSON: Right. In fact, the  
24 engineering design spectrum approach that they  
25 described we felt was too vague and that we would need

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1 definitely more detail. As a matter of note, we are  
2 currently engaged with industry on this very issue and  
3 have had several public meetings to discuss this.

4 JUDGE COLE: So at some later date, they  
5 might modify the approach that's currently being used  
6 to incorporate something like the engineer design  
7 feature.

8 DR. MUNSON: Right. I'm not 100 percent  
9 certain the path they will take at COL, but this is a  
10 topic that will be revisited at COL.

11 JUDGE COLE: But they did go forward with  
12 another procedure, the reference probability approach.

13 DR. MUNSON: Correct, and that's the  
14 approach recommended in Regulatory Guide 1.165.

15 JUDGE COLE: Yes. Now in that, they  
16 modify the recommended procedure of Reg. Guide 1.165  
17 is it?

18 DR. MUNSON: Correct.

19 JUDGE COLE: And the reference probability  
20 recommended was  $1 \times 10^{-5}$ . Now if they use a higher  
21 reference probability, what does that do to the SSE  
22 end result? Is it more or less conservative?

23 DR. MUNSON: The basis for Regulatory  
24 1.165 is that the current existing operating reactors  
25 do not present an undue health risk in the area of

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1 seismic. In other words, their SSE are adequate.  
2 That's the basis for the reference probability for  
3 those 29 sites that I showed.

4 So Regulatory Guide 1.165 recognizes that  
5 every ten years or so there will -- It will be  
6 necessary to update this reference probability value  
7 as our understanding of the seismic hazard evolves and  
8 the Applicant chose to update the reference  
9 probability based on that. Appendix B and Regulatory  
10 Guide 1.165 include specific direction on updating the  
11 reference probability and specifies that the staff  
12 will review alternative reference probabilities on a  
13 case-by-case basis.

14 JUDGE COLE: Okay. Now they gave three  
15 reasons to justify using a different reference  
16 probability and in reading those three reasons, it  
17 seems to me that each one of those regions would  
18 mitigate towards more seismic hazard. Is that  
19 correct, sir?

20 DR. MUNSON: The three reasons they gave  
21 were that the ground motion models have been updated  
22 and changed. Those ground motion models which  
23 actually the Applicant will show a figure to  
24 illustrate the difference, they will have increased  
25 slightly the hazard in the 10 Hertz frequency range.

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1 JUDGE COLE: The first one was the return  
2 period of the control earthquakes, right?

3 DR. MUNSON: No, the first one was the  
4 recurrence. I believe the first one was the  
5 recurrence for the New Madrid and Charleston seismic  
6 source zones have been reduced. So there is a  
7 potential for some sites near those source zones to  
8 have higher reference probabilities.

9 JUDGE COLE: So if that earthquake comes  
10 back more frequently, that's a considerable hazard  
11 increase.

12 DR. MUNSON: I wouldn't use the word  
13 "considerable." It depends on how far the sites are  
14 located from those earthquake zones.

15 JUDGE COLE: All right.

16 DR. MUNSON: If you look at this figure,  
17 Figure 10, you'll note that the Applicant used a mean  
18 reference probability value as opposed to a median  
19 reference probability value. The hazard curves shown  
20 on this figure are median hazard curves. Since the  
21 Applicant selected to use a mean reference  
22 probability, the mean hazard curves are higher than  
23 the median hazard curves because the ground motion is  
24 generally normally distributed. As such, the  
25 reference probabilities values, annual probability of

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1 accedence we will go up to a higher hazard curve so  
2 that the reference probabilities values would be  
3 slightly higher.

4 JUDGE COLE: Would that make up for the  
5 difference between the median?

6 DR. MUNSON: What we looked at was we  
7 looked at the controlling earthquakes that were  
8 determined using the  $5 \times 10^{-5}$ . We looked at those  
9 controlling earthquakes and we determined that they  
10 adequately represent the hazard that we expected to  
11 see for the site. The 5.4 at 12 miles and the 7.2, I  
12 believe, for the Charleston seismic. Then we look at  
13 the ground motion that would be expected to come from  
14 those earthquakes and the staff's judgment was that  
15 that ground motion was very reasonable for those  
16 magnitude earthquakes. So the revised reference  
17 probability we felt more than adequately results in an  
18 SSE of adequate conservatism adequately reflecting the  
19 site hazard.

20 JUDGE COLE: Compared favorably with the  
21 29 reactor sites in the CEUS.

22 DR. MUNSON: What we did was we -- as I  
23 mentioned in the slide, as we used an alternative  
24 probabilistic hazard map from the U.S. Geological  
25 Survey to get a reference value, to get an idea of

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1 what the Applicant was proposing and where that stands  
2 in lieu of this other probabilistic hazard and we felt  
3 that that also gave us reassurance that the Applicant  
4 was proposing only a modest increase in the reference  
5 probability value.

6 JUDGE COLE: But you did get a reduction  
7 in the SSE curve.

8 DR. MUNSON: We looked at what the  
9 Applicant would have gotten had they used the median  
10 of  $1 \times 10^{-5}$  and we determined the ground motion was  
11 very high on that from a 5.4 at 12 miles and the  
12 distant Charleston earthquake. The ground motion had  
13 they used the Regulatory Guide 1.165. Median  $1 \times 10^{-5}$   
14 was very high.

15 JUDGE COLE: But doesn't that mean that  
16 you should address that if it is high? What is that's  
17 what you should be doing?

18 DR. MUNSON: The point is that looked at  
19 current hazard estimates using the USGS and using the  
20 Applicant's arguments and we determined that the  
21 reference probability that was determined in  
22 Regulatory Guide 1.165 back in the late '80s and early  
23 '90s, that value not longer reflects a current  
24 understanding of the seismic hazard.

25 JUDGE COLE: So it was unreasonable to use

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1 that.

2 DR. MUNSON: Correct.

3 JUDGE KARLIN: Can I jump in here? Let me  
4 go to page 2.177 of the safety evaluation report and  
5 this seems to be pages 177 and 178 for what we're  
6 talking about here. As I understand, there's a  
7 reference probability talked about up here. There's  
8 a reference probability that Reg. Guide 1.165  
9 establishes that before you site a new nuclear  
10 reactor, you're supposed to meet that reference guide  
11 or generally, the staff is to look at that in this  
12 determination of whether it's safe enough. Right?

13 DR. MUNSON: The reference probability  
14 used to determine the SSE after the probabilistic  
15 seismic hazard has been completed.

16 JUDGE KARLIN: Okay. Does that translate  
17 into the reference guide as some sort of mechanism to  
18 tell whether or not the probability of the earthquake  
19 is too high for the site to put a new nuclear reactor  
20 on?

21 DR. MUNSON: No.

22 JUDGE KARLIN: No.

23 DR. MUNSON: The reference probability is  
24 used as a baseline to determine what the SSE should  
25 be, the level.

1 JUDGE KARLIN: An SSE is a safety shutdown  
2 earthquake.

3 DR. MUNSON: What should be for the site.

4 JUDGE KARLIN: So for each, if you want to  
5 build a new reactor on a site, you sort of want to  
6 find out what the safe shutdown earthquake is going to  
7 be for that site putting a reactor there.

8 DR. MUNSON: Correct.

9 JUDGE KARLIN: And the way you do that is  
10 there's a reference probability for that which is what  
11 you're referring to here.

12 DR. MUNSON: Correct. The median  $1 \times 10^{-5}$ .

13 JUDGE KARLIN: And so the reference  
14 probability of this reg. guide is  $1 \times 10^{-5}$  median  
15 probability.

16 DR. MUNSON: Right.

17 JUDGE KARLIN: And this site doesn't meet  
18 that standard.

19 DR. MUNSON: This site used the revised  
20 reference --

21 JUDGE COLE: No, but I want to know. Does  
22 this site meet that standard of  $1 \times 10^{-5}$  median?

23 DR. MUNSON: The SSE does not meet.

24 JUDGE KARLIN: So the safe shutdown  
25 earthquake doesn't meet that standard for this site.

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1 DR. MUNSON: Correct.

2 JUDGE KARLIN: And that's the standard  
3 that's normally used and that the reg. guide says you  
4 should normally use.

5 DR. MUNSON: The regulatory guide  
6 recommended that reference probability. It also  
7 recommended in Appendix B that the hazard be updated,  
8 excuse me, the reference probability be updated every  
9 ten years to reflect current understanding.

10 JUDGE KARLIN: Yes. Maybe it -- Has it  
11 been updated? What's the most recent reference  
12 probability?  $1 \times 10^{-5}$ ? Is that the current reference  
13 probability?

14 DR. MUNSON: That's the current value.

15 JUDGE KARLIN: And this site doesn't meet  
16 it.

17 DR. MUNSON: That's correct.

18 JUDGE KARLIN: Okay. And the Applicant  
19 proposed that they wanted a more lenient standard for  
20 seismic risk at this site. Is that basically the gist  
21 of what we're talking about here?

22 DR. MUNSON: Correct. They proposed a 5  
23  $\times 10^{-5}$  which --

24 JUDGE KARLIN: All right.  $5 \times 10^{-5}$  instead  
25 of  $1 \times 10^{-5}$ , median versus mean.

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1 DR. MUNSON: Correct.

2 JUDGE KARLIN: I know there's a  
3 median/mean issue here and you have this on this reg.,  
4 but does that mean a 500 percent greater risk of a  
5 seismic problem?

6 DR. MUNSON: It means that --

7 JUDGE KARLIN: A  $1 \times 10^{-5}$  versus  $5 \times 10^{-5}$ ?

8 DR. MUNSON: It means that, excuse me, if  
9 they were using the original reference probability  
10 that they would have an SSE based on the 100,000 year  
11 recurrence.

12 JUDGE KARLIN: Yes, instead of once every  
13 500,000 years which is what the requirement is. They  
14 want once every 100,000 years.

15 DR. MUNSON: Excuse me. It's actually --  
16 The requirement is once every 100,000 and they were  
17 proposing once every 20,000,  $5 \times 10^{-5}$ .

18 JUDGE KARLIN: So the reference guide says  
19 you're supposed to have -- the risk is supposed to be  
20 one in 100,000 years and they want it reduced to 1 in  
21 20,000 years.

22 DR. MUNSON: The reference guide is based  
23 on the understanding the premise that the current  
24 reactors --

25 JUDGE KARLIN: Right.

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1 DR. MUNSON: And so the current reactors  
2 then with the Applicant is in a sense saying that  
3 100,000 is out of date.

4 JUDGE KARLIN: Let me just ask on that.  
5 I want to probe what the reference reactors are.  
6 They're 29 reference reactors, right? You have a  
7 slide that shows that. That's helpful. Perhaps we  
8 should go to that and those represent 29 existing  
9 nuclear reactors that are built in the Central and  
10 Eastern United States. Is that right?

11 DR. MUNSON: That's correct. They are  
12 listed in Appendix B of Regulatory Guide.

13 JUDGE KARLIN: And when were those sites'  
14 reactors built?

15 DR. MUNSON: I don't have specific dates  
16 for all of them but it was intended that these 29  
17 sites be more recent designs, have more recent seismic  
18 designs than earlier.

19 JUDGE KARLIN: But the seismic issues seem  
20 to be related to the site, not to the design of the  
21 reactor. So I just wondered when were they built.  
22 Were they built in the '70s some of them? Were they  
23 built in '90s?

24 PARTICIPANT: In the '70s.

25 DR. MUNSON: No, obviously not in the

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1 '90s.

2 JUDGE KARLIN: Were they built in the '70s  
3 mostly?

4 DR. MUNSON: Seventies, yes.

5 JUDGE KARLIN: Okay. And so would those  
6 29 nuclear reactors that were built in the '70s and  
7 the operating assumption is here in 2007 the safety  
8 standard we want to use is the same standard we used  
9 in the 1970s?

10 DR. MUNSON: It's a relative measure. In  
11 other words, we're looking at these 29 sites relative  
12 to their seismic designs. In other words, in the '70s  
13 we used the deterministic approach. We selected a  
14 maximum credible earthquake.

15 JUDGE KARLIN: Right.

16 DR. MUNSON: A ground motion from that  
17 maximum credible earthquake was estimated at the site  
18 and these SSEs for these 29 sites were anchored to  
19 that peak acceleration value.

20 JUDGE KARLIN: So in the 1970s or  
21 thereabouts, the 29 nuclear reactors were sited and  
22 that's the reference safety standard we're using for  
23 siting of a new nuclear reactor in 2007. Is that  
24 right? The earthquake risks for those 29 sites sited  
25 in the '70s.

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1 DR. MUNSON: That's correct.

2 JUDGE KARLIN: Yes. And more recently I  
3 guess what you're saying is when you update, when  
4 someone updates, the reference probability, do they  
5 change the sites or do they just get their pencils out  
6 and recalculate the risks?

7 DR. MUNSON: We stayed with these same 29.

8 JUDGE KARLIN: So you have the same sites  
9 that were sited then and if suddenly, it's found that  
10 those sites are considerably more dangerous than they  
11 thought back in the 1970s, that results in a  
12 relaxation of the reference probability.

13 DR. MUNSON: If it's determined --  
14 Obviously we would take immediate action if we saw  
15 imminent danger.

16 JUDGE KARLIN: No, not imminent danger  
17 because 20,000 years in not imminent. If the recent  
18 calculations show that those sites are a lot risky  
19 than they were thought to be, that results in a  
20 relaxation of the reference probability.

21 DR. MUNSON: If it's determined that these  
22 sites -- that the premise still is valid, then, right,  
23 the reference probability would be recalculated.

24 JUDGE KARLIN: I think of the analogy of  
25 a car if I was a regulatory agency dealing with safety

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1 of cars and there was a 1975 Buick or something like  
2 that and it met the standards of 1975 and I came in  
3 here in 2007 and I said, "Well, safe is safe. If it  
4 was safe in 1975, we ought to use that standard for  
5 regulating cars today." Is that a good analogy?

6 DR. MUNSON: Well, perhaps I should  
7 backtrack a bit. Regulatory Guide 1.165, the  
8 reference probability approach described in this was  
9 developed as I said in the mid 1990s with the  
10 understanding of the seismic hazard in the late '80s,  
11 early '90s using these 29 sites that were built in  
12 '70s. This is the first use of Regulatory Guide  
13 1.165. These three, the ESP sites represent the first  
14 use of Regulatory Guide 1.165.

15 As a lesson learned from these ESP  
16 applications, we've learned that this regulatory guide  
17 has a limitation, has a shortfall, and that's why we  
18 have gone out and developed a new regulatory guide  
19 which uses a different approach to determining SSE  
20 which is the performance based approach which I  
21 described in my written testimony.

22 JUDGE COLE: Which isn't ready yet.

23 DR. MUNSON: Excuse me. It is.

24 JUDGE COLE: It is?

25 DR. MUNSON: It is.

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1 JUDGE KARLIN: That was not used in this  
2 application.

3 DR. MUNSON: It was used initially by  
4 North Anna. They used the performance based approach  
5 which is the subscribed in a American Society of  
6 Civil Engineering Standard. They used that approach  
7 and our initial response to them was "this is a new  
8 approach. We need more time" and in response, they  
9 said, "Well, we don't want to have them over time. So  
10 we're going to use a revised reference probability."

11 They ended up enveloping the performance  
12 based approach. In other words, this  $5 \times 10^{-5}$  SSE  
13 envelopes a performance based approach which we later  
14 have --

15 JUDGE KARLIN: What does "envelopes" mean?

16 DR. MUNSON: That means the SSE developed  
17 using the  $5 \times 10^{-5}$  envelopes the performance based SSE  
18 in a sense, the SSE would have been determined.

19 JUDGE KARLIN: So what is the higher SSE  
20 guidance?

21 DR. MUNSON: It's on top of it. It's the  
22 same.

23 JUDGE KARLIN: So the performance based  
24 approach would result in a more relaxed seismic or  
25 higher seismic risk than the current approach that you

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1 used here.

2 DR. MUNSON: I don't understand. Could  
3 you rephrase that?

4 JUDGE KARLIN: As I understand it, the  
5 existing reg. guide has a reference probability. The  
6 reference probability is  $1 \times 10^{-5}$  at one in 100,000  
7 years. They are proposing one in 20,000 years. That  
8 sounds like a risky proposition. You are saying that  
9 the performance based approach would grant them the  
10 one in 20,000 years. Is that more risky than one in  
11 100,000 years?

12 DR. MUNSON: It is.

13 JUDGE KARLIN: Okay.

14 DR. MUNSON: Rather than targeting, using  
15 a reference probability, we used a performance target,  
16 the performance of a reactor and we determined that  
17 would provide adequately conservative SSEs.

18 JUDGE KARLIN: I'll let you go back to it.  
19 But let me just ask one other. The reference  
20 probability from the reg. guide, we're using Central  
21 and Eastern U.S., 29 reactors that were built in the  
22 '70s or something. If I was out in California or  
23 something and wanted to site something, would we use  
24 the same 29 reference reactors?

25 DR. MUNSON: No. They would have to --

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1 The reference probability of  $1 \times 10^{-5}$  median would not  
2 -- It's only for Central and Eastern U.S. sites.

3 JUDGE KARLIN: But I thought the reference  
4 probability was a function of what the regulatory  
5 agency, the NRC, thinks is safe.

6 DR. MUNSON: And we --

7 JUDGE KARLIN: Does a safety make a  
8 difference whether you're in California or here?

9 DR. MUNSON: It doesn't and we would  
10 evaluate. We would have to evaluate the proposed  
11 reference probability on a case-by-case basis.

12 JUDGE KARLIN: But shouldn't the reference  
13 probability, at least the standard that you start with  
14 for safety, be the same in the Eastern and Western  
15 United States?

16 DR. MUNSON: This reference probability is  
17 based on Central and Eastern U.S. sites. So that's --

18 JUDGE KARLIN: So if you have an area  
19 that's riskier, then it's okay to have riskier nuclear  
20 reactors.

21 DR. MUNSON: All I can say is that we  
22 would have to evaluate on a case-by-case basis what  
23 they're proposing, what a Western U.S. site would  
24 propose.

25 JUDGE KARLIN: Okay. Makes sense. Sorry

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1 I interrupted.

2 JUDGE COLE: Question 60 getting back to  
3 something we talked about a little bit before, the  
4 Applicant proposed a seismic reference probability for  
5 the ESP be relaxed by a factor of five. We discussed  
6 some of that, but we talked about the three items that  
7 they used as a justification based on three items.  
8 The first one was recent ground motion studies for the  
9 CEAU as to predict higher values for higher frequency  
10 ground motions. That would mitigate towards a higher  
11 value of acceleration. Right?

12 DR. MUNSON: Correct.

13 JUDGE COLE: The second one, the  
14 recurrence interval, they have more information about  
15 the recurrence interval at some of the seismic sites  
16 and a decreased rates at New Madrid and Charleston,  
17 decrease them from over 1,000 to 500 or 600 years.  
18 That also would mitigate towards increased seismic  
19 safety or what would its effect be?

20 DR. MUNSON: Its effect would be that  
21 these sites closer to these two earthquake zones would  
22 have, perhaps have higher reference probability  
23 values, higher hazard curves.

24 JUDGE COLE: How would it affect the North  
25 Anna site?

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1 DR. MUNSON: There would not be an effect  
2 for the North Anna site.

3 JUDGE COLE: Not be an effect. And a use  
4 of the mean rather than the median value, I think one  
5 of the questions we asked is we know how many of the  
6 29 reactors are above and below the median. Do you  
7 happen to know for the mean value how many reactors  
8 are in the lower portion than the higher portion, the  
9 distribution is different?

10 DR. MUNSON: When this regulatory guide  
11 list developed, the  $1 \times 10^{-5}$  median reference probably  
12 was equivalent to a  $1 \times 10^{-4}$  mean reference  
13 probability.

14 JUDGE COLE: Okay.

15 DR. MUNSON: So there is a factor,  
16 obviously a factor of ten. So  $1 \times 10^{-5}$  median  
17 reference probability corresponded to a  $1 \times 10^{-4}$  mean  
18 reference probability.

19 JUDGE COLE: So that would -- The effect  
20 on that would be what with respect to the SSE?

21 DR. MUNSON: In other words, since they're  
22 proposing  $5 \times 10^{-5}$  which is lower than that  $1 \times 10^{-4}$   
23 mean value, that's obviously lower than the equivalent  
24 mean value for the  $1 \times 10^{-5}$  median.

25 JUDGE COLE: So you are satisfied that the

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1 procedures that the Applicant used to determine the  
2 safe shutdown earthquake is sufficiently conservative  
3 that the staff would sign off on that.

4 DR. MUNSON: That is correct. We in our  
5 judgment, the controlling earthquakes and the ground  
6 motion from those controlling earthquakes used to  
7 determine the SSE adequate review reflect the hazard,  
8 the local and regional seismic hazard, for this site.

9 JUDGE COLE: The thing that concerned me  
10 and I'll try to paraphrase it or identify it is that  
11 we start out with the premise that the seismic design  
12 of these 29 existing reactors is satisfactorily safe  
13 and conservative and we assume that that's enough to  
14 protect the public health and safety. We use that as  
15 a base.

16 Now when we have found out more  
17 information about the seismicity of the areas and the  
18 timing of earthquakes and distances, would this  
19 mitigate towards indicating that since these existing  
20 reactors have survived through all this that they're  
21 even safer than we thought they were and then we can  
22 justify relaxing the standards?

23 DR. MUNSON: In the 1990s, we recognized  
24 the higher hazard that we're talking about and they  
25 implemented what's called an IPEEE program, Individual

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1 Plant External Event Examinations, and each of these  
2 plants looked at the external event possibilities and  
3 this is before -- I wasn't part of the IPEEE results,  
4 but the conclusions where that the plants had ample  
5 margins for seismic and recently we have decided that  
6 the information presented with these ESP applications  
7 we decided to take another look at what is the impact  
8 of this for current operating reactors. So we have a  
9 generic issue 199 on that. We've been proactive to  
10 take into account these advances in estimate of  
11 seismic hazard and their impact on current reactors.

12 JUDGE COLE: So it's a work in progress.

13 DR. MUNSON: That's correct.

14 JUDGE COLE: All right, sir. Thank you.

15 JUDGE KARLIN: So if I can understand what  
16 you just said, the original sites, reactors were put  
17 on these original 29 sites. Everyone thought they  
18 were safe. It was analyzed. Subsequently, new  
19 information has come to light to show that there are  
20 higher seismic risks than was thought. Is that right?

21 DR. MUNSON: Higher seismic hazard for  
22 some. Potentially higher seismic hazard for some  
23 sites.

24 JUDGE KARLIN: And the Agency decided  
25 that's still safe enough. Right?

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1 DR. MUNSON: Correct.

2 JUDGE KARLIN: And now the Agency is using  
3 that as a reference probability for new sites.

4 DR. MUNSON: That's correct. That's how  
5 1.165 was issued.

6 JUDGE KARLIN: And now the Applicant wants  
7 something even more lenient than that.

8 DR. MUNSON: The revised reference  
9 probability is -- That's correct.

10 JUDGE KARLIN: Okay. I think we'd better  
11 take a break at this point. You've been on for a  
12 little awhile and we've all been here for about a hour  
13 and forty minutes. I know that we still have some  
14 questions. I believe Dr. Elleman has some questions  
15 for you.

16 So if we could take a ten minute or so  
17 break. The clock back there says 10:43 p.m. if I can  
18 make it out. So let's meet at 10:55 p.m. Okay.  
19 Thank you. We're adjourned. Off the record.

20 (Whereupon, at 10:43 a.m., the above-  
21 entitled matter recessed and reconvened at 10:56 a.m.  
22 the same day.)

23 JUDGE KARLIN: Please be seated. We are  
24 now back on the record continuing with the hearing.  
25 Let me just remind you, Mr. Munson, you are still

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1 under oath. Please proceed.

2 JUDGE COLE: Just one or two questions,  
3 Mr. Munson. With the use of mean versus the median  
4 and the use of a reference probability of 1 times 10-5  
5 versus 5 times 10-5, what is the magnitude of the  
6 difference in the calculated result for the SSE? Do  
7 you know?

8 DR. MUNSON: I would need to have the --  
9 to determine the -- we looked at that. I recall  
10 looking at that, but off the top of my head right now,  
11 I know that ground motions were considerably higher  
12 using the 1 times 10-5 median reference probability  
13 value.

14 I believe that -- let me see if I can find  
15 -- I believe that seven and a half hertz is where the  
16 five and ten hertz, where that is scaled up to at  
17 seven and a half hertz. I believe it was about .8g  
18 using the median 1 times 10-5, as opposed to if we  
19 look at their reference probability -- their SSE.  
20 Excuse me. Of course --

21 JUDGE COLE: And what page is that, sir?

22 DR. MUNSON: Page 2-187. It would be --  
23 if you look at figure 252-6 on page 2-97 --

24 JUDGE COLE: Yes, sir.

25 DR. MUNSON: -- at 7 and a half hertz,

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1 that is the control point where you would scale the  
2 high frequency. Their value is, I believe, between --  
3 around .5, maybe .45.

4 JUDGE COLE: Well, being a large-scale, I  
5 have trouble with it.

6 DR. MUNSON: And then --

7 JUDGE COLE: Yes.

8 DR. MUNSON: -- if I recall looking at  
9 what would have been had we used the median 1 times  
10 10-5, I believe it was closer to .8g.

11 JUDGE COLE: All right, sir. And it is  
12 your opinion that that modification was justified,  
13 departure from the recommendation of reg guide 1.165?

14 DR. MUNSON: It is my judgment that this  
15 SSE is an adequate representation of the hazard for  
16 the site.

17 JUDGE COLE: All right, sir. Thank you.

18 JUDGE ELLEMAN: Dr. Munson, I'm going to  
19 apologize in advance for the sixth grade level of my  
20 questions because, unfortunately, that's about the  
21 level of my understanding of this field. So I hope  
22 you will cut me a little bit of slack in this subject.

23 When I look at any new field, I start by  
24 assuming that the volume of material approximates the  
25 importance of that subject. And my colleague, Judge

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1 Karlin, chastised the staff the other day for the  
2 paucity of information we were given on radioisotopic  
3 transport in soil. But you certainly cannot level  
4 that accusation against the seismic area because there  
5 are literally hundreds of pages of information,  
6 including field notes, in the application.

7 The seismic area is probably the most  
8 extensively treated in the staff reviews. And my  
9 reaction is something is going on. And I have been  
10 trying to figure out what is going on and what has  
11 changed and what is different. And I have not reached  
12 a point of personal satisfaction at all in that quest.

13 The things that seem to be going on from  
14 what I have heard is that the recurrence values for  
15 earthquakes have changed, that the site-specific  
16 earthquake doesn't meet the standard for the site,  
17 that we have abandoned the use of reg guide 1.165 and  
18 switched to a performance basis approach for the  
19 earthquake.

20 What else is going on? What is making  
21 this a sensitive subject at this point, in addition to  
22 what I have talked about?

23 DR. MUNSON: I guess I am at a loss. We  
24 wanted to thoroughly cover the applicant's seismic  
25 hazard characterization, thoroughly review it. That's

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1 why I felt that it was necessary to describe in detail  
2 our review of the application.

3 We found that the use of regulatory guide  
4 1.165 -- as I wrote in my written testimony, it was  
5 somewhat problematic with this reference probability  
6 approach.

7 JUDGE ELLEMAN: I don't think we have seen  
8 that testimony, have we, the written testimony?

9 DR. MUNSON: It is. It is in response to  
10 question --

11 JUDGE ELLEMAN: Oh, you mean in response  
12 to questions?

13 DR. MUNSON: Yes.

14 JUDGE ELLEMAN: Oh, okay. Excuse me.  
15 Yes.

16 DR. MUNSON: So we -- the regulatory guide  
17 1.165 represented a substantial, I think, improvement  
18 in the definition of how we characterize seismic  
19 hazard. It defines a probabilistic approach, which  
20 systematically incorporates uncertainties in the  
21 hazard estimates. And it's only the actual  
22 implementation of determining the SSE that -- where we  
23 ran into problems with regulatory guide 1.165.

24 JUDGE ELLEMAN: And how would you define  
25 that problem? What is the problem related to?

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1 DR. MUNSON: The problem is that as -- the  
2 problem is that for the North Anna site or for any  
3 site that wants to -- the problem is that it's not  
4 amenable to change. In other words, the reference  
5 probability is based on 29 sites.

6 To do a probabilistic seismic hazard  
7 analysis for those 29 sites is -- would be extremely  
8 time-consuming and costly. And in the end, you would  
9 have a reference probability value that would probably  
10 be out of date shortly.

11 JUDGE ELLEMAN: And it would be out of  
12 date shortly why?

13 DR. MUNSON: As we have seen over the past  
14 ten years, you know, those recurrences have gone down.  
15 Ground motion models have changed. All these go into  
16 determining the reference probability. The  
17 probabilistic seismic hazards approach incorporates  
18 the ground motion models, seismic source  
19 characterizations. All these factors are part of the  
20 probabilistic seismic hazard approach, which is used  
21 to determine the reference probability value.

22 So, rather than tying the reference  
23 probability or the measure we used to determine the  
24 SSE to these 29 central and Eastern U.S. reactors, the  
25 staff determined that it was a better approach to pick

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1 a performance target that we felt provided adequate  
2 safety, adequate hazard for the sites, for the new  
3 sites. In other words, they will use this performance  
4 target to determine the SSEs, rather than the  
5 reference probability value.

6 JUDGE ELLEMAN: Now, if you had not made  
7 that change, does that translate into the applicant  
8 having to build a much more robust structure than you  
9 would otherwise have to build?

10 DR. MUNSON: No, it doesn't.

11 JUDGE ELLEMAN: It does not?

12 DR. MUNSON: These ground motions that we  
13 are talking about you have to remember, the higher  
14 ground motions are ten hertz and above. These are not  
15 damaging ground motions to structures, to these  
16 massive nuclear power plant structures.

17 JUDGE KARLIN: Can I pursue that just a  
18 little bit? Page 177 again, if you had used the  
19 reference probability of reg guide 1.165 and said,  
20 "No. We're not going to vary from that. We're just  
21 going to stick with that one," it's my understanding  
22 that this site doesn't meet it.

23 DR. MUNSON: That's correct.

24 JUDGE KARLIN: So what would the  
25 consequence be if you had --

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1 DR. MUNSON: The consequences --

2 JUDGE KARLIN: They couldn't build?

3 DR. MUNSON: No.

4 JUDGE KARLIN: The ASP?

5 DR. MUNSON: The consequences would be  
6 that their site SSE would have higher high frequency  
7 ground motion, ten hertz and above.

8 JUDGE KARLIN: All right. Let me just  
9 back up. You have a reference probability. It is  
10 something you use to evaluate the appropriateness of  
11 the site and the proposed permit? It doesn't meet it?

12 Options would be deny the permit or do  
13 something more robust to mitigate against the fact  
14 that this site is more risky.

15 DR. MUNSON: What I am trying to say is  
16 that it is not more risky. The ground motion that  
17 we're talking about here is, if you look on page  
18 2-182, --

19 JUDGE KARLIN: Okay. I'm opening there.  
20 Yes, sir. All right. Yes. He said sixth grade.  
21 Let's try third grade.

22 JUDGE ELLEMAN: Logarithms. I can't  
23 handle logarithms, yes.

24 DR. MUNSON: I mean, the figure is 2-187.  
25 I mean, it's the same thing, but it's the SSE

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1 spectrum. What I'm saying --

2 JUDGE KARLIN: All I'm trying to say is 1  
3 times 10-5 is different than 5 times 10-5.

4 DR. MUNSON: Right.

5 JUDGE KARLIN: And I take it that 5 times  
6 10-5 is more risky.

7 DR. MUNSON: That's correct. What I'm --  
8 excuse me. That's not correct. What I'm saying is  
9 had they used 1 times 10-5, --

10 JUDGE KARLIN: Yes.

11 DR. MUNSON: -- they would have a much  
12 higher peak if you look at that figure in the high  
13 frequency range.

14 JUDGE KARLIN: Higher peak.

15 DR. MUNSON: Okay. In the 10 to 100 hertz  
16 range.

17 JUDGE KARLIN: Yes.

18 DR. MUNSON: That ground motion, that  
19 ground motion excitation is not damaging in general to  
20 massive nuclear power plant structures.

21 JUDGE KARLIN: So meaning reg guide 1.165  
22 reference probability is not -- you don't have to meet  
23 it. It's no problem one way or the other?

24 DR. MUNSON: No. I mean, we look -- I  
25 guess it comes down to the staff's judgment of the

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1 ground motion that is determined using the reference  
2 probability value to determine earthquake magnitudes  
3 and distances. And what I'm saying is that in  
4 general, these very high frequency ground motions do  
5 not damage massive nuclear power plant structures,  
6 these large foundation structures.

7 As I pointed out in response to question  
8 --

9 JUDGE KARLIN: I'm sorry. You were saying  
10 reg guide 1.165's reference probability is not a  
11 problem, not a value because, in fact, reactors won't  
12 be damaged if it's higher than that value?

13 DR. MUNSON: In general for this site  
14 since it's a rock site, the high frequencies are not  
15 dampened, attenuated. So by using a 1 times 10-5, you  
16 are going to see even higher high frequencies.

17 For other sites, it would be a different  
18 case. You would see lower frequencies. But for this  
19 site, the high frequencies dominate. These high  
20 frequencies at this site are not damaging in general  
21 to nuclear power plant structures.

22 There may be some relays or contacts that  
23 may need to be analyzed to ensure that these high  
24 frequencies are not damaging, but for the foundations,  
25 the reactor, these high frequency ground motions are

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1 not our concern. I mean, they're a concern, but they  
2 are not what we were focused on in general.

3 JUDGE KARLIN: If I got that, then, this  
4 site is characterized by a high rock of subsurface.  
5 In that context, what you would see if an earthquake  
6 occurs is a higher frequency earthquake, I guess.

7 DR. MUNSON: That's correct.

8 JUDGE KARLIN: And that is, higher  
9 frequency earthquakes are less of a problem to large  
10 structures than the lower frequencies that would be  
11 perhaps more predominant. There is more soil in other  
12 material, you know, plants, soil, whatever, under the  
13 site.

14 DR. MUNSON: That's correct.

15 JUDGE KARLIN: Okay.

16 JUDGE ELLEMAN: Well, I guess what I am  
17 hearing is there are not any structural implications,  
18 then, in switching from reg guide 1.165 to a  
19 performance-based approach.

20 DR. MUNSON: They're not. We're just  
21 switching to -- are you talking about the two  
22 reference probabilities --

23 JUDGE ELLEMAN: Yes.

24 DR. MUNSON: -- or switching from 1.165 to  
25 the performance-based approach?

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1 JUDGE ELLEMAN: Well, the second one was  
2 what I was attempting to ask, but maybe that's not  
3 even an appropriate question.

4 DR. MUNSON: Yeah. I'm not sure.

5 JUDGE KARLIN: You're a judge. You can  
6 ask him questions.

7 (Laughter.)

8 JUDGE ELLEMAN: Things have been changed  
9 in terms of how you are approaching the issue. And I  
10 am trying to get at what the construction implications  
11 could be of those changes.

12 And if you had not made a change, would  
13 that imply one degree of robustness of structure that  
14 is different from the robustness of the structure that  
15 would be built using your alternate, second approach  
16 to it?

17 DR. MUNSON: No.

18 JUDGE ELLEMAN: It would not?

19 DR. MUNSON: It would not.

20 JUDGE ELLEMAN: So from the applicant,  
21 there is nothing that affects him in terms of what he  
22 has got to do by these changes?

23 DR. MUNSON: "The applicant" meaning North  
24 Anna?

25 JUDGE ELLEMAN: Meaning Dominion, yes.

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1 DR. MUNSON: Right. There is not.

2 JUDGE ELLEMAN: Okay. One of the things  
3 you said is that the recurrence values have decreased.  
4 Where does that come from?

5 DR. MUNSON: That comes from -- what is  
6 done is geologists go out in the field and look at  
7 what are called paleoliquefaction features; in other  
8 words, evidence of older, distant earthquakes,  
9 prehistorical earthquakes. And they use these -- they  
10 date these features and determine from that when  
11 subsequent earthquakes have happened in a seismic  
12 zone.

13 In other words, we look at New Madrid. We  
14 look at the distribution of paleoliquefaction  
15 features. We date those features and determine what  
16 is the interval between severe ground motions and that  
17 seismic zone.

18 JUDGE ELLEMAN: Okay.

19 DR. MUNSON: So over the past 10-15 years,  
20 more intensive study has been done in New Madrid to  
21 determine that these larger 7.5, just to throw out  
22 that number, magnitude earthquakes have occurred on  
23 average every 500 years, as opposed to every 1,000 or  
24 more or so years.

25 JUDGE ELLEMAN: So is it a factor of two

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1 or more change that has to be made?

2 DR. MUNSON: That's correct.

3 JUDGE ELLEMAN: And that then also applies  
4 to our expectation of the frequency of a severe  
5 earthquake in this part of the world, then, or here in  
6 Virginia? Is that true?

7 DR. MUNSON: That is not true. It is only  
8 local to that particular seismic zone.

9 JUDGE ELLEMAN: Okay. There were answers  
10 that you prepared for us to questions that I wasn't  
11 completely sure that I understood. There have been  
12 statements that the existing nuclear plants are safe,  
13 that that is a basic assumption that we are making.

14 And it isn't clear to me how we can assume  
15 that. It seems to me we can only say that we haven't  
16 had an earthquake event of a severity sufficient to  
17 impact them at this point.

18 DR. MUNSON: We haven't had that event.  
19 That's correct.

20 JUDGE ELLEMAN: Yes.

21 DR. MUNSON: But at the same time, we have  
22 looked at, through the IPEEE program, we have looked  
23 at, external events for each of these central and  
24 Eastern U.S. reactor sites.

25 What we found was that increases are

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1 generally in this high frequency rate per site.

2 JUDGE ELLEMAN: Frequency increases?

3 DR. MUNSON: The high frequency ground  
4 motion. The ground motion increases are in the high  
5 frequency range, --

6 JUDGE ELLEMAN: High frequency range.

7 DR. MUNSON: -- similar to what we are  
8 seeing with North Anna.

9 JUDGE ELLEMAN: Yes.

10 DR. MUNSON: And we determined that this  
11 high frequency ground motion increase would into  
12 increase the risk to these reactors. In other words,  
13 these high frequency ground motions are not going to  
14 damage these nuclear reactors.

15 JUDGE ELLEMAN: Okay. In response to  
16 question 56 in our environmental statement, I believe  
17 you wrote that Dominion had not obtained an  
18 engineering design spectrum because a specific reactor  
19 design has not yet been selected. And I confess that  
20 went right by me.

21 What is an engineering design spectrum?  
22 And what is the importance of that?

23 DR. MUNSON: I don't know what an  
24 engineering design spectrum would be in the context.  
25 They alluded to that as a possible spectrum that they

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1 would be using for the actual design of the system  
2 circulars and components, but that was not spelled out  
3 explicitly in the application.

4 JUDGE ELLEMAN: All right. So you're not  
5 able to help me on that response?

6 DR. MUNSON: That's correct.

7 JUDGE ELLEMAN: Okay. I think I am not  
8 going to benefit anybody by proceeding further in my  
9 questioning on this subject.

10 JUDGE KARLIN: Okay. Dr. Cole, any  
11 questions? I don't think I have any further  
12 questions, Dr. Munson. So I think that's fine. I  
13 appreciate your testimony. We appreciate your time  
14 and testimony.

15 (Whereupon, the witness was excused.)

16 JUDGE KARLIN: We would then ask the  
17 applicant to bring its panel forward on this topic.

18 MR. LEWIS: Judge Karlin?

19 JUDGE KARLIN: Yes?

20 MR. LEWIS: Their slides have not yet been  
21 marked as an exhibit and admitted. So I am going to  
22 provide three copies to the reporter and then copies  
23 to the judges and staff.

24 JUDGE KARLIN: Why don't you proffer them  
25 into evidence, identify them, and then give them to

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1 the law clerk? She will note them. And absent  
2 objection, we will admit them.

3 MR. LEWIS: Thank you, Judge Karlin. I  
4 would like to proffer Dominion presentation on seismic  
5 safety by Dr. William R. Lettis, Dr. Robin K. McGuire,  
6 Dr. John Davie and ask that this be marked as Dominion  
7 exhibit 16.

8 JUDGE KARLIN: All right. Please present  
9 them to the clerk.

10 (Whereupon, the aforementioned  
11 document was marked for  
12 identification as Dominion  
13 Exhibit Number 16.)

14 JUDGE KARLIN: Are there any objections  
15 from the staff?

16 MS. POOLE: Staff has no objections.

17 JUDGE KARLIN: None? All right. Then  
18 they will be admitted.

19 (Whereupon, the aforementioned  
20 document, having previously  
21 been marked for identification  
22 as Dominion Exhibit Number 16,  
23 was received in evidence.)

24 JUDGE KARLIN: Thank you for reminding us.  
25 If you all would please rise and raise

1 your right hand?

2 (Whereupon, the panel of witnesses were  
3 duly sworn.)

4 JUDGE KARLIN: Thank you. Please sit  
5 down. And, if you would, proceed with your  
6 presentation. Identify yourselves. That would be  
7 helpful.

8 And I would say, Dr. Lettis, welcome back.  
9 We scheduled this specifically for your benefit.

10 (Laughter.)

11 JUDGE KARLIN: I hope you appreciate  
12 you're last, but certainly not least, here.

13 DR. LETTIS: Thank you, Your Honor.

14 JUDGE KARLIN: We wanted to do seismic  
15 first. We are really excited about it, but we have  
16 made it to the end.

17 DR. LETTIS: Thank you. And good morning.  
18 My name is William Lettis. I am a geologist  
19 specializing in the assessment of geologic and seismic  
20 hazards for large facilities, such as nuclear power  
21 plants.

22 On our first slide, our overview, I will  
23 be presenting the geologic/seismic source  
24 characterization and surface vault rupture hazard  
25 assessment that was performed at the ESP North Anna

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1 site.

2 Sitting to my left is Dr. Robin McGuire.  
3 He will describe the vibratory ground motion  
4 evaluation and development of the SSE, or safe  
5 shutdown earthquake, ground motion for the site.

6 And John Davie is a geotechnical engineer.  
7 He doesn't have a prepared presentation, but he is  
8 available to answer any questions you might have on  
9 geotechnical.

10 JUDGE KARLIN: It's Dr. John Davie.

11 DR. LETTIS: Dr. John Davie.

12 JUDGE KARLIN: I want to get this right.

13 DR. LETTIS: Slide 3 provides the guidance  
14 and the investigations that we performed at the site  
15 to evaluate the geologic and seismic conditions.

16 We followed the regulatory guidance  
17 provided in the standard review plan, our reg guide  
18 1.70, specifically section 2.5, guidance, which covers  
19 the geological, seismological, and geophysical  
20 characterization of the site. And we explicitly  
21 followed the guidance provided in reg guide 1.165,  
22 which lays out a very orderly and detailed manner in  
23 which you shall perform your work and document your  
24 work.

25 The investigations that we performed at

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1 the site included review of previous reports prepared  
2 for the North Anna power station. We reviewed both  
3 published as well as available unpublished geologic  
4 maps and literature covering the site area and the  
5 site region extending out to a 200-mile area. We  
6 analyzed and interpreted aerial photography in the  
7 five-mile radius area around the site covering the  
8 entire five-mile radius area.

9 We performed geologic field and aerial  
10 reconnaissance. I personally performed this  
11 reconnaissance along with Scott Limball with my  
12 office. This field and aerial reconnaissance again  
13 focused on the 5-mile area radius around the site but  
14 also extended out to a 25-mile radius to evaluate  
15 specific geologic and tectonic features. And in some  
16 occasions, we performed work beyond the 25-mile  
17 radius, as called for in terms of evaluating potential  
18 features.

19 And, in addition, we contacted local  
20 researchers, both with the U.S. Geological Survey and  
21 with academia, who were performing geologic and  
22 seismologic work in the site region, to make sure that  
23 we're not missing anything that was currently being  
24 worked on but has not yet been published. Plus, if we  
25 had questions regarding their published maps or

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1 literature, we wanted to ask them questions about  
2 that. So we contacted those current researchers.

3 Next slide, slide 4, presents our results  
4 in section 2.5.1. The standard review plan provides  
5 specific sections in what should be covered in each of  
6 these subsections of chapter 2.5 or section 2.5.

7 2.51 covers the regional and site geology.  
8 In this section, we characterize the physiographic  
9 characteristics of the site, the geologic history, the  
10 stratigraphy, and the tectonic and structural setting  
11 within the full 200-mile radius around the site, which  
12 is defined as the site region.

13 And, as called for in reg guide 1.165, we  
14 prepared 4 geologic maps at progressively increasing  
15 detail, 2 regional maps at 225-mile radiuses around  
16 the site, and then 2 local geologic maps of 5-mile and  
17 .6-mile radiuses around the site. And those geologic  
18 maps provide the basis from which to make subsequent  
19 evaluations of the seismic sources in the site area  
20 and region that might produce vibratory ground motion  
21 at the site.

22 Slide 5 is one of those four geologic  
23 maps. It is the five-mile radius map around the North  
24 Anna site. North Anna is located in a central portion  
25 of the figure where my cursor is. It's along the

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1 southwestern shore of Lake Anna.

2 This geologic map is a compilation of two  
3 principal sources. The northern part is from Nixon,  
4 et al., published in the year 2000. And the  
5 southernmost part of the figure is a map published in  
6 2002 by Marr. The --

7 JUDGE KARLIN: When you say the southern,  
8 there's a band at the bottom of the map.

9 DR. LETTIS: Yes.

10 JUDGE KARLIN: Is that the map splice  
11 between the two published geologic maps.

12 JUDGE KARLIN: Okay. All right.

13 DR. LETTIS: And we remain faithful to  
14 what was published by each. The northern orifice of  
15 the site area here is the map by Nixon published by  
16 the U.S. Geological Survey.

17 The map along the southern portion of the  
18 figure is a map published by Marr with the Virginia  
19 Geological Survey. And those represent the most  
20 currently published geologic information in the site  
21 area.

22 The five-mile radius is shown in this red  
23 circle around the site. This map shows in the  
24 different colors the different rock types that area  
25 mapped in the region. As you can see, they follow a

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1 northeast trend across the site. And these different  
2 map units are generally separated by faults, which  
3 have been mapped.

4 Both the geologic units and the faults  
5 date from approximately 200 million to 600 million  
6 years ago and are not believed to be active. Within  
7 this five-mile radius, we performed, as I mentioned  
8 earlier, both aerial and field reconnaissance and air  
9 photo interpretation to verify those previous  
10 conclusions that these faults are not active.

11 And we not only looked at the faults  
12 themselves, but through due diligence, we looked at  
13 the entire area to see if there are any previously  
14 unmapped faults that might have gone unrecognized,  
15 specifically looking for geomorphic features or  
16 features on the landscape that might be indicative of  
17 potential fault activity. And there are none.

18 There is a fault called Fault A that  
19 traverses the North Anna site. It's this fault map,  
20 has a black line through the central part of the  
21 figure. This fault was originally identified in the  
22 excavations for the abandoned units 3 and 4 and was  
23 mapped originally over an extent of about 3,000 feet.

24 JUDGE KARLIN: That's, as I understand it,  
25 the line marked by the small "a," "small a."

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1 DR. LETTIS: Yes, Your Honor.

2 JUDGE KARLIN: Okay.

3 DR. LETTIS: That fault was mapped  
4 originally in 1973 over a distance of 3,000 feet.  
5 During the original North Anna site investigation,  
6 extensive study was performed, including mapping the  
7 excavation walls, trenching along the fault to  
8 evaluate both its location across the site, but also  
9 any evidence for activity or developing positive  
10 evidence demonstrating the absence of activity.

11 And the result of that investigation in  
12 1973 provided conclusive evidence that the fault was  
13 not active in the last approximately 200 million  
14 years. They have radiometric dating on crystals  
15 within the fault zone that have not been subsequently  
16 shared. And those crystals date to between 200 and  
17 300 million years ago.

18 In addition, they looked at the soil over  
19 line and fault trace. That soil has not been  
20 disrupted by any more recent fault activity. And the  
21 soil has been dated to more than a million years old.

22 This work was reviewed by the NRC staff.  
23 The staff concurred with the conclusion at that time  
24 Fault A was not a capable fault.

25 Since that time, as you can see on this

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1 map, the fault has been extended over a distance of  
2 approximately seven miles. This work was done by a  
3 geologist, Lou Pavlides, at the U.S. Geological  
4 Survey.

5 Dr. Pavlides is since deceased, and we  
6 were unable to talk with him. His work was compiled  
7 by Nixon into this compilation map that is shown here.

8 And we spent an extensive amount of effort  
9 walking the entire fault length, flying aerial  
10 reconnaissance over the fault to, first of all, verify  
11 its existence, if we could; and, second, make sure  
12 that along his newly mapped length of the fault, that  
13 there was no evidence of recent fault activity such  
14 that it would be considered a capable tectonic source.

15 And we were able to conclude that there is  
16 no evidence of recent fault activity. In fact, we do  
17 not believe that this map length is correct. There is  
18 no evidence that this fault extends as shown on this  
19 map by Nixon.

20 JUDGE KARLIN: Let me ask you on that now.  
21 Now, this doctor, what was his name?

22 DR. LETTIS: Lou Pavlides.

23 JUDGE KARLIN: Is it Dr. Pavlides?

24 DR. LETTIS: Yes.

25 JUDGE KARLIN: Okay. He is the one who --

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1 and I saw this in the reports by the staff. He came  
2 up with this idea that this fault extended further  
3 than was originally thought. Is that right?

4 DR. LETTIS: That's correct.

5 JUDGE KARLIN: Okay. You need to answer  
6 because they won't pick it up.

7 And so this map shows the Fault A as the  
8 longer length that Dr. Pavlides came up with --

9 DR. LETTIS: That's correct.

10 JUDGE KARLIN: -- thought existed. And  
11 you went out to try to determine whether there was any  
12 validity to this longer -- you agree that there was a  
13 fault there. The question that Dr. Pavlides has, does  
14 it go longer or more extensive than originally  
15 thought? Is that right?

16 DR. LETTIS: Yes.

17 JUDGE KARLIN: And what did you do to  
18 check this out? You walked it? Then you?

19 DR. LETTIS: We performed field  
20 reconnaissance.

21 JUDGE KARLIN: What does that mean?

22 DR. LETTIS: We went to the field. We  
23 looked at -- we drove every road in the area that  
24 crossed the fault trace, looked at road exposures,  
25 where the fault should have been if it was truly

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1 there. We also walked on the ground surface to see if  
2 there -- we could identify any evidence that would  
3 support this mapped location.

4 We flew aerial reconnaissance over the  
5 fault, along its entire length, looking for any  
6 lineaments or other features that would suggest a  
7 juxtaposition of different rock types that would  
8 suggest a fault is present.

9 And we could find no evidence for this  
10 fault. In fact, in the road cuts, which are far and  
11 few between in this area -- it's a very hilly area  
12 covered with soil primarily. But in some of the road  
13 cuts crossing the fault, we could find no evidence for  
14 the fault as an actual feature.

15 In addition, not mapped on this map is  
16 what we call a Miocene impediment surface. That's an  
17 old erosional surface, approximately five to eight  
18 million years old, that extends across this whole  
19 region. It's an erosional surface. So it's not a  
20 mapped rocking. So it doesn't show up on the geologic  
21 map.

22 But this Miocene erosion surface, which  
23 beveled off the landscape over five million years ago,  
24 it's actually a marine invasion. And the waves  
25 beveled off the landscape. We can piece that former

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1 landscape together. And it crosses over this fault.  
2 And you can show that the fault does not deform that  
3 five million-year-old landscape.

4 So there's no vertical offset along the  
5 fault that would suggest it's been active in the last  
6 five million years along that length as mapped by Lou  
7 Pavlides.

8 JUDGE KARLIN: If I may just follow up on  
9 that, I mean, what I was trying to say was, you went  
10 out and did some field investigation to evaluate  
11 whether this was a correct extension of the fault.

12 I'm wondering. Your field studies  
13 consisted of walking along the area that was  
14 apparently the fault, driving some of the roads that  
15 would cross the fault, and flying over it and looking  
16 at it.

17 DR. LETTIS: And also interpreting aerial  
18 photography in this area.

19 JUDGE KARLIN: And you found nothing? Is  
20 that the way one would go? Are there other methods  
21 you can do to see if there is a fault? Can you  
22 actually punch a hole in the ground?

23 There used to be with Shell Oil Company,  
24 stick a piece of dynamite in somewhere and then listen  
25 and see if there is some sort of a --

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1 DR. LETTIS: Yes.

2 JUDGE KARLIN: -- vibration that occurs.

3 DR. LETTIS: Yes, Your Honor. The initial  
4 step for evaluating a fault is first to do the  
5 activities I just indicated: field reconnaissance,  
6 aerial reconnaissance, interpretation of aerial  
7 photography. If you can through those studies  
8 demonstrate the absence of a fault, that usually  
9 satisfies the condition.

10 If there's continued uncertainty about  
11 either the location or the activity, you would  
12 excavate a trench with a backhoe across the fault  
13 trace or the suspected location of the fault trace,  
14 which is what was done by Dominion in 1973 to map the  
15 location of the fault across the site. They excavated  
16 several trenches to follow the fault until it died  
17 out.

18 JUDGE KARLIN: So you could have done a  
19 trench somewhere up where you're doubtful, it's  
20 uncertain whether the fault continues?

21 DR. LETTIS: Yes, we could have done that.

22 JUDGE KARLIN: It seems to me if you walk  
23 it or you fly it, I mean, nothing has happened in the  
24 last million years. Are you likely to see a whole lot  
25 other than just soil there?

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1 DR. LETTIS: No. In our judgment, I don't  
2 believe we would have found a fault if we excavated a  
3 trench. There's no evidence --

4 JUDGE KARLIN: No. But my question is a  
5 visual look-see of the place. I mean, the surface  
6 environment would be relatively active with mixed  
7 soils, moving trees growing. Are you likely to see  
8 anything just by looking? I mean, I guess you've got  
9 to look to see, but are you likely to see the fault if  
10 it's an old one?

11 DR. LETTIS: Absolutely. Usually when --  
12 I've done many fault studies searching for active  
13 faults, searching for faults that aren't active.

14 JUDGE KARLIN: But you have just said this  
15 one is over 200 million years old. So if you were  
16 trying to figure out the location of a 200  
17 million-year-old fault and you're going to extend it  
18 out and see if it goes further, are you likely to see  
19 anything on the surface?

20 If, as you say, there has been no change  
21 in that fault for 200 million years, are you likely to  
22 find it its extension by just looking at the surface  
23 or do you have to dig a trench? In 200 million years,  
24 won't the surface have enough that it's not going to  
25 show the fault?

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1 DR. LETTIS: No.

2 JUDGE KARLIN: Okay. So if I go to the  
3 North Anna site right now, you could point out to me  
4 there is the fault. You can see it?

5 DR. LETTIS: No.

6 JUDGE KARLIN: Could you see it?

7 DR. LETTIS: No.

8 JUDGE KARLIN: All right. Well, if you  
9 don't see it somewhere else, it means it's not there  
10 either?

11 DR. LETTIS: No. If I could explain?

12 JUDGE KARLIN: Okay. Yes.

13 DR. LETTIS: A fault is a plane along  
14 which differential movement occurs between rock units.  
15 If a fault is present, even though it hasn't been  
16 active in 200 million years, it has -- in the bedrock  
17 has offset the bedrock unit.

18 In road cuts across that, where the road  
19 cut cuts down through the soil and into the rock down  
20 below, if a fault is there, whether it's been active  
21 --

22 JUDGE KARLIN: In the bedrock, cuts into  
23 the bedrock?

24 DR. LETTIS: Yes, sir. It would still be  
25 there.

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1 JUDGE KARLIN: Okay.

2 DR. LETTIS: In the road cuts that we  
3 examined across the fault, we could not find a fault  
4 in the bedrock at the locations mapped by this --

5 JUDGE KARLIN: Okay. So you did see road  
6 cuts that were cut into the bedrock --

7 DR. LETTIS: Yes.

8 JUDGE KARLIN: -- that would have revealed  
9 the existence of a fault --

10 DR. LETTIS: Yes.

11 JUDGE KARLIN: -- if it were there? And  
12 you didn't find it? Okay.

13 DR. LETTIS: In addition, as shown on this  
14 map is this green body. That's an intrusive rock,  
15 which is quartz-rich.

16 JUDGE KARLIN: This is called the Elk  
17 Creek pluton?

18 DR. LETTIS: The Elk Creek pluton is a  
19 granitic intrusive rock.

20 JUDGE KARLIN: All right.

21 DR. LETTIS: And it's intruded into the  
22 orangish pink material, which is the surrounding  
23 metamorphic rock. The soil, even when you don't see  
24 the rock itself, the soil will reflect the different  
25 minerals that are in those two different rock types.

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1 One will be more quartz-rich soil. This will have an  
2 absence of quartz in the soil.

3 So we spent a lot of time walking along  
4 this fault looking for quartz in the soil that might  
5 suggest we were seeing the offset. We were, in  
6 particular, walking the contact between the Elk Creek  
7 pluton and the surrounding metamorphic rock looking  
8 for this offset contact right here. And we cannot  
9 find it.

10 And whether the fault exists or not is  
11 more or less immaterial. What's more important is, is  
12 there evidence that would suggest that it has been  
13 recently active? Because it's been mapped over this  
14 greater length, the study performed in 1973 focused on  
15 just that 3,000-foot-long reach.

16 We wanted to make sure that we looked at  
17 this entire newly mapped length to make sure there was  
18 no evidence over the entire seven-mile length of no  
19 recent fault activity. That was -- that is the more  
20 important objective for the safety of this site in  
21 determining whether or not there is a potential for  
22 surface fault rupture through the site or generating  
23 an earthquake near the site.

24 JUDGE ELLEMAN: What amount of shift can  
25 you pick up with the kinds of methods you have

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1 described? Can you pick up a six-inch shift?

2 DR. LETTIS: No, not in -- if it's only  
3 moved six inches, no.

4 JUDGE ELLEMAN: Several feet?

5 DR. LETTIS: The resolution of our ability  
6 to identify a fault is highly dependent on if that  
7 several feet occurs with a very well-defined mappable  
8 geologic contact, we can pick up several feet.

9 JUDGE ELLEMAN: But more likely it would  
10 require a shift of many feet for you to discern it by  
11 those techniques?

12 DR. LETTIS: Yes. Typically the -- once  
13 again, there's two things I want to make sure we're  
14 clear. One is, is the fault present? And the second,  
15 is it active?

16 If this fault had had a shift or  
17 displacement of several feet in the last several, tens  
18 of thousands of years, we would likely see it. If  
19 this fault has had several feet of offset 200 million  
20 years ago, we likely would not see that.

21 So partly it -- in terms of recognizing  
22 its existence, we probably would not recognize its  
23 existence if it only had a few feet of offset.

24 JUDGE KARLIN: But if I understand, the  
25 essence, if I'm hearing, is there is a fault there.

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1 Is that correct?

2 DR. LETTIS: Yes, sir.

3 JUDGE KARLIN: Its last activity appears  
4 to be very old or 200 million, 300 million years ago.  
5 Is that right?

6 DR. LETTIS: Yes, Your Honor.

7 JUDGE KARLIN: And the fault is under the  
8 site, along the site, but you have found nothing to  
9 confirm; in fact, you do not think it goes -- its  
10 length is as long as the Dr. Pettis or whatever came  
11 up with.

12 DR. LETTIS: Dr. Pavlides, yes.

13 JUDGE KARLIN: Pavlides.

14 DR. LETTIS: We found no evidence --

15 JUDGE KARLIN: But the important  
16 contribution is not how it is but how old it is and  
17 how active it is. And it seems to be very old and  
18 inactive.

19 DR. LETTIS: That's correct.

20 JUDGE KARLIN: Okay. So moving to slide  
21 6, the conclusion in section 2.53 of the SAR, which  
22 documents the absence of potential for permanent  
23 ground deformation at the site, including surface  
24 fault rupture, tectonic rupture, as well as forms of  
25 non-tectonic or man-induced deformation at the site,

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1 we conclude there is no potential for tectonic surface  
2 faulting through the site on Fault A or any other  
3 fault that might be present.

4 There is no potential for other forms of  
5 non-tectonic permanent ground deformation, such as  
6 dissolution collapse that you might have in limestone  
7 terrain or growth faulting that you might have in the  
8 Gulf of Mexico or differential subsidence. We found  
9 no evidence. And there is no potential for other  
10 forms of non-tectonic deformation.

11 In addition, we found no evidence that  
12 would indicate the site has experienced severe or  
13 strong ground shaking. There is no evidence for  
14 liquefaction in the five-mile site area. There is no  
15 evidence of fissuring or earthquake-induced  
16 landsliding in the site area.

17 Section 2.52 in the SAR characterizes the  
18 vibratory ground motion at the site. I will first  
19 describe our characterization of the seismic sources  
20 before turning it over to Dr. McGuire, who will  
21 describe the actual probabilistic seismic hazard  
22 analysis and development of a safe shutdown  
23 earthquake.

24 As part of the seismic source  
25 characterization, we started with the Electric Power

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1 Research Institute 1986 seismic source model for the  
2 Eastern United States. This EPRI 1986 source model  
3 has been reviewed and approved by the NRC staff and is  
4 an allowable starting point in regulatory guide 1.165  
5 as an approved starting basis from which to evaluate  
6 the seismic sources in the region.

7 So our charge is to start with the EPRI  
8 1986 source model and evaluate all post-1986 published  
9 data and unpublished information that we can find,  
10 talk to researchers, and identify if there's any new  
11 information that would suggest the EPRI 1986 source  
12 model should be updated or improved or revised. And  
13 this included updating the seismicity catalogue that  
14 was the EPRI catalogue extended up through 1984. We  
15 updated the source catalogue from 1984 up to 2001 as  
16 part of this application.

17 JUDGE KARLIN: Are you referring to the 29  
18 central and Eastern United States sites we were  
19 talking about earlier?

20 DR. LETTIS: No, sir.

21 JUDGE KARLIN: No? Okay.

22 DR. LETTIS: That's a different topic.  
23 Those are sites that were --

24 JUDGE KARLIN: When you say, "We updated  
25 the catalogue," what is the catalogue?

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1 DR. LETTIS: The seismicity catalogue, the  
2 record, the historical and instrumental record of past  
3 earthquakes that have occurred.

4 JUDGE KARLIN: Where?

5 DR. LETTIS: In the Eastern United States;  
6 in particular, within the 200-mile site region around  
7 North Anna.

8 JUDGE KARLIN: Okay. Go on.

9 DR. LETTIS: This is an example of the  
10 EPRI seismic source model. The EPRI seismic source  
11 model consists of six independent teams which  
12 independent characterize the earthquake sources in  
13 central and Eastern United States. This is one of  
14 those six teams. It is the study performed by Bechtel  
15 as part of the 1986 EPRI study. On here, North Anna  
16 is the red dot in central or Eastern Virginia. I'm  
17 sorry.

18 On this slide, you can see the seismicity,  
19 the plots of earthquake epicenters. Those shown in  
20 yellow are a part of the EPRI seismicity catalogue up  
21 through 1984.

22 Those shown in orange, orange squares,  
23 these symbols over here, are the update from 1984 to  
24 the present. We update the seismicity to see is there  
25 any change in pattern of seismicity, rate of

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1 seismicity, or magnitude of seismicity that might  
2 cause us to change the 1986 EPRI source model. And  
3 based on this updated seismicity, we see no change for  
4 making any revisions to the EPRI source model.

5 JUDGE KARLIN: And by "seismicity," you  
6 mean earthquakes or seismic events?

7 DR. LETTIS: Yes.

8 JUDGE KARLIN: Okay.

9 DR. LETTIS: Shown on here are the seismic  
10 sources defined by Bechtel. This source that I am  
11 identifying in the North Anna region is called the  
12 central Virginia seismic source. There is an area of  
13 increased seismicity in the central Virginia region.  
14 This is how Bechtel, this earth science team, depicted  
15 that aerial source. They drew this geometry to  
16 envelope that area of increased seismicity. Other  
17 teams drew similar but somewhat different circles  
18 around this seismicity.

19 Also shown on this figure, on figure 8, is  
20 the Charleston, the location of the 1886 magnitude 7  
21 to 7.5 Charleston earthquake. This is also a  
22 potential seismic source that we evaluated. And there  
23 is new information since 1986 which causes us to  
24 modify or update the EPRI source model for this source  
25 in the Charleston area, including the

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1 paleoliquefaction information that has been developed  
2 in the last 15 years, which suggests that the 1886  
3 type earthquake can have a recurrence of around 500  
4 years, as opposed to several thousand years, which was  
5 used in the EPRI model. In addition, the magnitude  
6 range is now thought to be between 6.8 and 7.5 for  
7 that earthquake that occurred in 1886.

8 And we also allowed this earthquake to  
9 float further to the north, toward the North Anna site  
10 along what is called the East Coast fault system, the  
11 southern segment of the East Coast fault system, which  
12 extends up to the border of South Carolina and North  
13 Carolina.

14 In addition, this East Coast fault system  
15 has been mapped by two authors, Marpole and Taiwani.  
16 Two people at the University of South Carolina have  
17 mapped a central segment in North Carolina and a  
18 northern segment in southern Virginia. So this is a  
19 newly postulated fault zone that we characterized as  
20 an update to the EPRI source model. And we performed  
21 a sensitivity analysis.

22 JUDGE KARLIN: That's not reflected on  
23 this map.

24 DR. LETTIS: No, I did not show the fault  
25 on this map.

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1 JUDGE KARLIN: Right.

2 DR. LETTIS: This map simply shows the  
3 Bechtel seismic sources --

4 JUDGE KARLIN: Right.

5 DR. LETTIS: -- that contribute to hazard  
6 at the North Anna site. As I've mentioned, there are  
7 two updates that we performed a sensitivity analysis  
8 on.

9 JUDGE KARLIN: Slide 9 now.

10 DR. LETTIS: We are on slide 9. Slide 9  
11 shows this update. We performed sensitivity analysis  
12 on the new Charleston source parameters, including the  
13 maximum magnitude range of 6.8 to 7.5, a recurrence  
14 interval of 550 years. And we allowed it to occur  
15 anywhere along the East Coast fault system southern  
16 segment, which allows it to come closer to North Anna  
17 and, therefore, is a conservative characterization.

18 We also performed a sensitivity analysis  
19 on the East Coast fault system northern segment to see  
20 if it would produce an increased hazard or ground  
21 motion at the North Anna site. Based on these  
22 sensitivity analyses, the only revision to the 1986  
23 EPRI source model is we added the new Charleston  
24 source representation that caused an increase in  
25 hazard in the long period ground motion at North Anna

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1 such that we needed to include this with the 1986 EPRI  
2 source model.

3 The northern segment did not significantly  
4 increase hazard at the site. Therefore, we did not  
5 include it in the final probabilistic seismic hazard  
6 calculations.

7 JUDGE KARLIN: Maybe I could ask. If you  
8 go back to the previous slide, maybe -- I'm sorry if  
9 I missed this. The large, I guess five large, sort of  
10 orange blocks, are those the segments you are  
11 referring to? What are those?

12 DR. LETTIS: No, sir. That's -- this  
13 slide is -- once again, is the Bechtel earth science  
14 team's characterization of earthquake sources that was  
15 performed in 1986. They identified the central  
16 Virginia source zone in this location around the site.

17 This zone of five orange bars here is  
18 called the Bristol trend. Bechtel felt that there was  
19 increase in seismicity in this zone. And, therefore,  
20 they identified this as a possible aerial source zone  
21 or a source of earthquakes.

22 They also identified, shown in the blue  
23 line on this figure, this offshore to year-shore zone,  
24 which is called the Atlantic Coast province. And that  
25 is where they allow the Charleston earthquake with

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1 some level of activity to occur up and down this.

2 JUDGE KARLIN: So the five orange bars are  
3 the Bristol trend --

4 DR. LETTIS: That's called the --

5 JUDGE KARLIN: -- identified by Bechtel --

6 DR. LETTIS: By Bechtel.

7 JUDGE KARLIN: -- as being in areas of  
8 what they postulated or thought would be increased  
9 seismicity?

10 DR. LETTIS: The heightened seismicity  
11 such that that is characterized by unique magnitude  
12 and recurrence parameters in the EPRI source model.

13 JUDGE KARLIN: Okay. I wasn't sure what  
14 that was.

15 DR. LETTIS: And then since 1986 -- this  
16 work was done in 1986. The actual EPRI calculation  
17 was performed in 1989, which Dr. McGuire will  
18 describe. But the source model was generated in 1986.  
19 Since 1986, there's been new information developed,  
20 including the location of this postulated East Coast  
21 fault system, which extends from the Charleston area  
22 up to southern Virginia. So that's not shown on this  
23 map because this is the true representation of the  
24 Bechtel source model.

25 So we updated the Charleston source down

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1 here. And we also performed sensitivity analyses on  
2 the northernmost part of the East Coast fault system  
3 that comes closest to the site. At its closest  
4 distance, it's about 70 miles from the North Anna  
5 site. So we performed a sensitivity analysis to see  
6 if that would contribute to ground motion of the site.

7 JUDGE ELLEMAN: Let me ask a question at  
8 this point, if I may. My sixth grade grandson told me  
9 the other day that recent Eastern seismic activity is  
10 believed to be a consequence of the fact that the ice  
11 sheet that covered the northern United States  
12 compressed the tectonic plates and distorted them in  
13 a way that now that the sheet is gone, the stresses  
14 are relaxing and this is producing the ground motion  
15 and action that contributes to the recent earthquakes.  
16 Was he putting me on or is this believed to be true?

17 DR. LETTIS: He's not putting you on.  
18 That's a hypothesis that some have advanced many years  
19 ago. The retreat of the glacial ice sheet within the  
20 first few thousand to ten thousand years or so, there  
21 will be rebound of the Earth's crust as the weight of  
22 the ice is removed.

23 And that causes glacial rebound faulting,  
24 which can be associated with seismicity. But the  
25 patterns of seismicity that we see now in the last 100

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1 or so years is long since the glacial retreat. And we  
2 are no longer -- the crust is no longer feeling or  
3 experiencing the stress, the isostatic rebound  
4 stresses, associated with the glacial retreat.

5 JUDGE ELLEMAN: But if that is a factor,  
6 wouldn't that imply that looking at very ancient fault  
7 movement is not necessarily relevant to what is going  
8 to happen in the future?

9 DR. LETTIS: Most glacial rebound faulting  
10 occurs along preexisting faults.

11 JUDGE ELLEMAN: It does?

12 DR. LETTIS: Yes, that we have found  
13 around the world. Some of the larger glacial rebound  
14 faults are found in England, for example. There are  
15 some up in southern Canada, but none of the faults --  
16 also let me add these glacial rebound faults break up  
17 to the ground surface and leave a distinct scar on the  
18 ground surface. There are no glacial rebound faults  
19 anywhere in the North Anna site region.

20 JUDGE ELLEMAN: Okay. So they are a  
21 special category of ground motion, then?

22 DR. LETTIS: Yes. They are actually not  
23 considered to be tectonic faults. They are a form of  
24 non-tectonic seismicity. And it's a matter of  
25 significant debate what size earthquake can be

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1 produced by glacial rebound faulting.

2 JUDGE ELLEMAN: Does a part of that debate  
3 presume that very major faults, very major ground  
4 motion can occur from this process?

5 DR. LETTIS: No. The glacial rebound  
6 faulting that is known so far is fairly locally  
7 restricted. And without getting into the debate about  
8 big an earthquake it can produce, there has been none  
9 in our historic time that we can pinpoint as being a  
10 glacial rebound earthquake. So we have very little  
11 data.

12 Certainly it's not occurring in the North  
13 Anna region. And it certainly is not the cause of the  
14 Charleston earthquake, which is the largest earthquake  
15 that has occurred in the Eastern United States.

16 Those are all of the seismicity, including  
17 the Charleston area. I am barely touching this. All  
18 of the seismicity that you see on this map, all these  
19 yellow and orange dots, are believed to be produced by  
20 actual tectonic forces, the tectonic plates. The  
21 stresses that are producing this are driven by the  
22 Midoceanic Spreading Center in the Atlantic Ocean,  
23 where the North American plate is moving westward away  
24 from the Oceanic Spreading Center as Africa and Europe  
25 are moving eastward.

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1           So these plates are moving apart from one  
2 another. And the push from the spreading center is  
3 pushing on the plate. And stresses are being  
4 transmitted through the plate. Plus, the plate is  
5 dragging, the base of the plate is dragging, on the  
6 mantle, which is producing a drag, a friction, or a  
7 stress that is imparted to the overriding plate.

8           So those two sources of stresses are water  
9 producing the earthquakes in Eastern and central North  
10 America. And those areas of stress increase are being  
11 localized along preexisting structures, which is what  
12 we believe is happening in the Charleston area. So  
13 past flaws in the crust are localizing the stresses  
14 until they build up to produce an earthquake.

15           JUDGE ELLEMAN: I was just going to ask,  
16 wasn't the Memphis earthquake on a different fault  
17 system and not relevant to this discussion?

18           DR. LETTIS: Yes. What you're referring  
19 to as the Memphis earthquake is actually the 1811-1812  
20 New Madrid earthquake sequence.

21           JUDGE ELLEMAN: Yes, I guess.

22           DR. LETTIS: Three large earthquakes  
23 occurred in December of 1811 and February of 1812, all  
24 of which are roughly magnitude 7 and a half to 8,  
25 largest earthquakes that have occurred in the U.S.

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1 potentially.

2 And those occurred on what we call the New  
3 Madrid seismic source zone or the New Madrid fault  
4 zone. And that is located in the central part of the  
5 continent along the Mississippi River through the  
6 Tennessee and Missouri area. And that does not  
7 produce strong ground motion at the North Anna site.

8 JUDGE KARLIN: I just wanted to note that  
9 it's noon right now. And you have almost used up your  
10 15 minutes.

11 (Laughter.)

12 JUDGE KARLIN: So moving right along --  
13 no. Please. We were asking questions, interrupting  
14 you. It is all very helpful, but let's jump back to  
15 the presentation.

16 DR. LETTIS: Well, this slide concludes my  
17 presentation. Slide 10 now discusses the development  
18 of the safe shutdown earthquake. And I'll turn the  
19 presentation over to Robin McGuire if you have no  
20 further questions for me.

21 JUDGE KARLIN: Yes. All right. Great.  
22 Dr. McGuire, yes?

23 DR. MCGUIRE: Thank you. And good  
24 afternoon.

25 JUDGE KARLIN: Good afternoon.

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1 DR. MCGUIRE: I am going to discuss the  
2 development of the vibratory ground motion and SSE.  
3 The basis for this is reg guide 1.165 and an  
4 evaluation of the reference probability, as discussed  
5 earlier by Dr. Munson.

6 The reference probability, as you know, is  
7 the annual probability level such that 50 percent of  
8 a set of currently operating plants has an annual  
9 median probability of exceeding that SSE. That is the  
10 definition in reg guide 1.165.

11 However, reg guide 1.165 also says that  
12 the reference probability calculation should be  
13 updated to accurately reflect updated knowledge about  
14 earthquakes and ground motions. Slide --

15 JUDGE COLE: How long has it been since  
16 it's been updated?

17 DR. MCGUIRE: It has not been updated.

18 JUDGE COLE: Ever?

19 DR. MCGUIRE: Reg guide 1.165 was issued  
20 in 1994, I believe. And this is the first application  
21 in which somebody has taken a look at it and said we  
22 need to evaluate the reference probability.

23 JUDGE COLE: Okay. Thank you.

24 DR. MCGUIRE: The SSE for the ESP site was  
25 determined by updating seismic hazard results and

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1 selecting a mean 5 times 10-5 probably exceeding the  
2 SSE.

3 As Dr. Munson stated, the NRC  
4 independently evaluated that reference probability and  
5 found it to be conservative by comparing that SSE --  
6 the SSE design levels at 29 existing plants in the  
7 central and Eastern U.S. to that reference  
8 probability.

9 JUDGE KARLIN: Well, now, wait a second.  
10 Didn't we try to deal with that earlier?  
11 Conservative. The reference probability is 1 times  
12 10-5 and this is 5 times 10-5 mean versus median. Are  
13 you saying that 5 times 10-5 is more conservative than  
14 1 times 10-5?

15 DR. MCGUIRE: No. My statement on the  
16 bullet there is just a reflection of the NRC staff's  
17 review.

18 JUDGE KARLIN: Well, they found it to be  
19 sufficiently safe, but did they find it to be  
20 conservative as compared to the reference standard?  
21 No, I think not. I think their testimony was it's  
22 more relaxed, less conservative than the standard.

23 DR. MCGUIRE: I think their conclusion, as  
24 they reflected in the bullet, was it was by comparison  
25 to the SSE level at 29 existing plants. They found --

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1 JUDGE KARLIN: Well, the SSE level was 1  
2 times 10-5. And you're proposing 5 times 10-5. And  
3 they said that's more risky and less conservative.  
4 And you're saying they found it to be conservative by  
5 comparison to that other standard.

6 It's not conservative, is it? It's more  
7 relaxed. Well, separate from the slide. Is it more  
8 conservative or more relaxed?

9 DR. MCGUIRE: If you are comparing mean 5  
10 times 10-5 to median 1 times 10-5, I think you're  
11 comparing apples and oranges. There is a difference  
12 between the mean and median.

13 JUDGE KARLIN: Yes, there is, I suppose,  
14 but is it more conservative or more relaxed? If this  
15 facility were required to meet the 1 times -- the reg  
16 guide says 1 times 10-5. Why did the applicant ask  
17 for a realization of that and doing something  
18 different?

19 DR. MCGUIRE: Because the applicant --

20 JUDGE KARLIN: Because it couldn't meet  
21 it?

22 DR. MCGUIRE: The applicant determined --  
23 well, initially the applicant determined a reference  
24 seismic design based on a performance-based goal,  
25 which is an absolute goal, has nothing to do with

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1 comparison of other designs.

2 The NRC said, "We would need more time to  
3 review that." And the applicant then went to an  
4 equivalent design, which was a mean 5 times 10-5,  
5 which is equivalent, and selected the envelope of  
6 those 2 as being an envelope; --

7 JUDGE KARLIN: Right.

8 DR. McGUIRE: -- that is, being more  
9 conservative, higher design of everything that it  
10 calculated.

11 JUDGE KARLIN: So yes, there was a  
12 performance approach. It was discussed earlier. But  
13 the reg guide, which is what the staff presumably  
14 starts with, this is less conservative than the reg  
15 guide standard, is it not?

16 DR. McGUIRE: If you mean by "the reg  
17 guide standard," designing to a median 1 times 10-5,  
18 --

19 JUDGE KARLIN: Yes.

20 DR. McGUIRE: -- it does not meet that  
21 standard. That's correct.

22 JUDGE KARLIN: Okay.

23 DR. McGUIRE: Under current hazard  
24 calculations, that's correct.

25 JUDGE KARLIN: Okay. Proceed.

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1 DR. MCGUIRE: Okay. On slide 12, we have  
2 a comparison of some seismic hazard curves for 10  
3 hertz spectral acceleration. And this is provided to  
4 indicate some of the change that has occurred since  
5 the 1989 studies of seismic hazard at the Eastern U.S.  
6 plants compared to the change caused by the 2003  
7 ground motion equations. So it was one of the changes  
8 that was mentioned earlier.

9 This is for the North Anna site. And the  
10 red curves indicate the new ground motions, the mean  
11 and median curves for ten hertz of spectral  
12 acceleration. And the blue curves indicate the  
13 seismic hazard using the 1989 ground motion equations,  
14 mean and median.

15 And this illustrates the fact that the  
16 mean curve is higher than the median curve. So if  
17 you're comparing required probabilities exceeding this  
18 annual, probability exceedance, we should not compare  
19 a mean value with a median value. The two are  
20 different.

21 Slide 13 shows where the contribution  
22 comes from in terms of high frequency ground motion,  
23 in this case higher frequency being defined as 5 and  
24 10 hertz ground motion. And it shows a deaggregation  
25 of the seismic hazard contribution to seismic hazard

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1 by magnitude and distance.

2 And, as you can see, the predominant  
3 contribution for these 5 and 10 hertz spectral  
4 accelerations comes from the smaller magnitudes at  
5 closer distances, magnitudes in the range 5 to 6, and  
6 distances in the range of zero to 50 kilometers.

7 That corresponds to the central Virginia  
8 seismic zone that Dr. Lettis illustrated earlier on  
9 his map. These are local earthquakes, local to  
10 central Virginia. And those are what are contributing  
11 to the high frequency ground motions.

12 JUDGE COLE: And what do we conclude about  
13 that with respect to seismicity at the North Anna  
14 site?

15 DR. McGUIRE: You would conclude that you  
16 should model the higher frequencies with a magnitude  
17 around 5 and a half and a distance of something like  
18 10 or 20 kilometers. And that's exactly what we did.  
19 I'll show that in a minute.

20 JUDGE KARLIN: Can you help me? Identify  
21 and tell me what the three axes are on this.

22 DR. McGUIRE: Okay. I'll --

23 JUDGE KARLIN: One is kilometers in the  
24 front.

25 DR. McGUIRE: That shows the distance of

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1 the earthquake, --

2 JUDGE KARLIN: Right.

3 DR. MCGUIRE: -- the one that says,  
4 "Distance." This scale on the right shows magnitude.

5 JUDGE KARLIN: Okay. The vertical scale  
6 --

7 DR. MCGUIRE: So that defines what  
8 magnitude of earthquakes contribute to that.

9 JUDGE KARLIN: Okay.

10 DR. MCGUIRE: And then the vertical scale  
11 shows a fraction of contribution to that 5 times 10-5  
12 mean hazard. So it's showing that the largest  
13 contribution, largest fraction of contribution, to  
14 that hazard comes from very small earthquakes, 5 to 5  
15 and a half magnitude, occurring at zero to 15  
16 kilometers.

17 JUDGE ELLEMAN: Should it be obvious to us  
18 that the magnitude goes up when you are at a distance  
19 of 50 to 100 kilometers and goes down when you are at  
20 closer distances?

21 DR. MCGUIRE: That is a characteristic  
22 typical of these deaggregation plots. And the reason  
23 is that large magnitudes only contribute to a larger  
24 distance because they are larger magnitudes. So a  
25 larger magnitude will contribute at a larger distance

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1 than a smaller magnitude.

2 JUDGE COLE: This is specific for the  
3 North Anna site?

4 DR. MCGUIRE: This plot is specific, yes.

5 JUDGE COLE: I don't see North Anna  
6 written anywhere on here.

7 DR. MCGUIRE: Thank you. This is specific  
8 to the North Anna site, yes. And it is figure 2.5-50  
9 in the ESP application.

10 Slide 14 shows a similar deaggregation for  
11 the North Anna site for lower frequency ground  
12 motions; that is, frequencies, spectral acceleration  
13 -- spectral frequencies of one and two and a half  
14 hertz.

15 And here you see a slight difference. You  
16 see that contribution from the local earthquakes in  
17 the central Virginia seismic zone from 5 to 5 and a  
18 half and zero to 50 kilometers.

19 We also see a contribution in the right  
20 corner there at distances greater than 300 kilometers  
21 and magnitudes greater than 7. And this is reflecting  
22 the contribution from the Charleston earthquake as we  
23 have modeled it and as Dr. Lettis indicated was  
24 modeled for the North Anna site. So at low  
25 frequencies of ground motion, there is some

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1 contribution, in this case about 20 percent, to the  
2 hazard at 5 times 10<sup>-5</sup>.

3 Slide 15 shows what we did with that  
4 deaggregation. We developed a high frequency  
5 earthquake, which is shown here in the red dashed  
6 curve, that's a spectrum developed from about -- from  
7 magnitude 5.4 at a close distance. And it shows the  
8 high frequencies that such a magnitude would generate  
9 there at the right end of the frequency scale, from 10  
10 to 100 kilometers.

11 The other earthquake that we developed was  
12 a low frequency earthquake, which was the magnitude  
13 7.2 at 190 miles or some 300 kilometers. And that's  
14 shown as the dashed blue curve. And that has more  
15 energy at low frequencies, so frequencies below one  
16 hertz. That is the envelope of the two curves.

17 And what was selected for the mean 5 times  
18 10<sup>-5</sup> reg guide envelope was the envelope of those two.  
19 So that the two curves were enveloped; that is, you  
20 picked the higher of the two at any frequency. And  
21 that became what we developed as the mean 5 times 10<sup>-5</sup>  
22 envelope.

23 JUDGE ELLEMAN: So the solid line shown at  
24 the top would be represented by the higher of the two  
25 intersecting curves on this plot?

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1 DR. MCGUIRE: That's correct.

2 JUDGE COLE: And did you construct a  
3 similar curve for the 1 times 10-5 frequency?

4 DR. MCGUIRE: No, we did not.

5 JUDGE COLE: And could you tell me the  
6 reason why you selected 5 times 10-5 as compared to  
7 the guidance of 1.165 of a frequency of 1 times 10-5?

8 DR. MCGUIRE: I would like to defer that  
9 question until slide 17 if I could.

10 JUDGE COLE: Okay.

11 DR. MCGUIRE: We determined the site  
12 response for these two earthquakes: the high  
13 frequency earthquake and the low frequency earthquake.  
14 We developed, as I just said, the envelope of the two  
15 earthquakes for high frequency and low frequency. And  
16 we also developed a performance-based spectrum. And,  
17 actually, in time this was developed prior to the 5  
18 times 10-5 spectrum.

19 And the performance-based spectrum was  
20 developed using the procedure of the American Society  
21 of Civil Engineers standard that has as its goal to  
22 achieve a performance of the plant and components of  
23 the plant.

24 And the 5 times 10-5 was selected, as I'll  
25 show on the next slide, because it is very similar to

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1 that, the results of that performance-based  
2 calculation.

3 Looking ahead, the SSE vertical spectrum  
4 was determined using appropriate vertical to  
5 horizontal ratios. And the operating basis earthquake  
6 was selected as one-third of the SSE, as allowed by 10  
7 CFR part 50.

8 JUDGE ELLEMAN: Could you please define  
9 performance-based spectrum?

10 DR. McGUIRE: Sure. The performance-based  
11 spectrum is developed so that we get a ground motion  
12 that would simple models of nuclear structures,  
13 systems, and components guarantees that the failure of  
14 that component will not be greater than some value.  
15 So it guarantees a performance in terms of risk of  
16 failure of specific components, systems, and  
17 structures.

18 And the value that is used to determine  
19 that is 1 times  $10^{-5}$  mean probability of failure. So  
20 the annual probability of failure of any specific  
21 component in the plant if we use the performance-based  
22 method is 1 times  $10^{-5}$  mean.

23 JUDGE ELLEMAN: And it is implemented on  
24 a component basis, not on a larger structure basis?

25 DR. McGUIRE: The development of the

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1 design spectrum, the performance-based spectrum, is  
2 implemented with generic representations at the  
3 fragilities components. That's how it's developed.

4 The actual performance of the plant in  
5 terms of seismic core damage frequency is much lower  
6 than one mean 1 times  $10^{-5}$ . In fact, it turns out  
7 using that same performance-based procedure the mean  
8 probability of seismic core damage frequency is around  
9 .5 to .2 times  $10^{-5}$ .

10 I know that because we have done  
11 calculations for the Electric Power Research Institute  
12 to demonstrate that. So the performance of the plant,  
13 this plant included because we have enveloped both the  
14 performance-based spectrum and the mean 5 times  $10^{-5}$   
15 spectrum, guarantees that the plant, as estimated by  
16 these simple models, will have a seismic core damage  
17 frequency that is around .5 to .2 times  $10^{-5}$ .

18 And that is better than a group of plants,  
19 25 plants, that, for instance, are reported in NUREG  
20 1742, which shows a composite of seismic core damage  
21 frequencies for plants at which a seismic  
22 probabilistic risk assessment was done.

23 And, actually, that plot is included in  
24 the ESP applications, plot 2.5, figure 2.5-52 shows  
25 seismic core damage frequencies for existing nuclear

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1 plants. And almost all of them are above 1 times 10-5  
2 in terms of seismic core damage frequency.

3 So the performance-based approach gives us  
4 a much safer plant than existing plants.

5 JUDGE ELLEMAN: Okay. I don't want to  
6 detour you here, but just intuitively it would seem to  
7 me if I have ten components, each of which has a given  
8 failure probability and if the failure of any one of  
9 them fails the structure, then the probability of  
10 structural failure would be higher, rather than lower,  
11 assuming any one of the components failing would cause  
12 non-function of the structure.

13 DR. McGUIRE: Unless they are redundant  
14 systems.

15 JUDGE ELLEMAN: Unless they are redundant  
16 systems.

17 DR. McGUIRE: Yes. And that is the power  
18 of probabilistic risk assessment is it accounts for  
19 parallel systems and redundant systems and sequential  
20 systems to determine the overall performance of the  
21 plant.

22 JUDGE ELLEMAN: Yes. But if they are not  
23 redundant systems --

24 JUDGE KARLIN: Can I just ask no  
25 conversation? It's a little distracting, please.

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1 Thank you. Go ahead.

2 JUDGE ELLEMAN: But if they're not  
3 redundant systems, then the structural reliability is  
4 lower than the component reliability.

5 DR. MCGUIRE: Yes. And that is studied in  
6 very much detail in seismic probabilistic risk  
7 assessments. And these 25 plants were  
8 multimillion-dollar studies at each plant to determine  
9 exactly the system response to account for parallel  
10 systems and sequential systems.

11 DR. MCGUIRE: The next slide, slide 18,  
12 shows a comparison --

13 JUDGE COLE: You didn't do 17.

14 DR. MCGUIRE: Ah. I didn't.

15 JUDGE COLE: You said you were going to do  
16 17. Then we got --

17 (Laughter.)

18 DR. MCGUIRE: I beg your pardon. I beg  
19 your pardon. This slide shows the envelope of all of  
20 the spectra that I have discussed so far. The blue  
21 curve is a low frequency, 5 times  $10^{-5}$ . The dashed  
22 red curve is the high frequency 5 times  $10^{-5}$ .

23 There is a performance-based spectrum that  
24 is shown there. And the selected SSE spectrum is the  
25 envelope of all of those. And that is the spectrum

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1 shown by the black dots. And that is the envelope of  
2 all of those, which it was selected based on the  
3 envelope of the mean 5 times 10-5 and the  
4 performance-based spectrum.

5 JUDGE COLE: I thought that you had to  
6 decide the exact system you were going to use before  
7 you could fully prepare the performance-based  
8 spectrum.

9 DR. MCGUIRE: No. I think I said it is  
10 based on a generic representation of system and  
11 component fragilities. So it's based on experience  
12 with seismic systems and components that are designed  
13 to certain levels and what the actual fragility and  
14 failure of those systems would be.

15 Now, I should point out that definition of  
16 failure is a very conservative definition of failure  
17 in that calculation. "Failure" is defined as any  
18 non-linear response of a system component or  
19 structure. And that is defined as failure, which is  
20 a very conservative definition of failure.

21 JUDGE COLE: All right, sir.

22 DR. MCGUIRE: Okay. Going on to slide 18,  
23 this shows an additional comparison, which is the  
24 selected SSE envelope, the performance-based spectrum,  
25 the mean, 5 times 10-5, and then some individual

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1 points there, which are extrapolations from the 1989  
2 studies. One was conducted by the Electric Power  
3 Research Institute. Those are the blue dots.

4 The other, shown as the red X's, are  
5 results from the 1999 Lawrence Livermore study. And  
6 these results are for North Anna. Both of those sets,  
7 the latter two sets from 1989, were extrapolated from  
8 published data. But the purpose here is to show that,  
9 even with the use of the old data, the outdated  
10 technology, we are still in the ballpark of what would  
11 be estimated by those studies for mean 5 times 10-5  
12 spectrum.

13 JUDGE KARLIN: May I ask, on these, all of  
14 these charts have in the right-hand corner there "five  
15 percent critical damping." Could you explain what  
16 that means and how it affects your charts and the  
17 results?

18 DR. MCGUIRE: Five percent is a standard  
19 damping that is used for linear single degree of  
20 freedom oscillators. So these response --

21 JUDGE KARLIN: Could you explain that?  
22 You lost me.

23 (Laughter.)

24 DR. MCGUIRE: Response --

25 JUDGE KARLIN: Let's start with damping.

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1 DR. MCGUIRE: Okay. Well, let me start  
2 with a response spectrum. This spectrum shows the  
3 response of an oscillator basically, a mass with a  
4 weight and a spring on it. It also has a damping  
5 because if you vibrate a mass, it doesn't vibrate  
6 forever. It slows down and finally stops.

7 Typical dampings of nuclear structures and  
8 components are in the range of 2 percent to maybe 10  
9 or 20 percent.

10 JUDGE KARLIN: Okay.

11 DR. MCGUIRE: We can convert. So we could  
12 calculate a spectrum for two percent damping. We can  
13 calculate spectrum for 20 percent damping. As you  
14 might expect, a two percent damping spectrum would be  
15 higher because a 2 percent damp system responds more  
16 vigorously than a 20 percent.

17 JUDGE KARLIN: Right. Everything is going  
18 on.

19 DR. MCGUIRE: Less damping is going on.  
20 About 20 percent damp spectrum would be much lower.  
21 But it's very easy to convert mathematically from one  
22 to the other. So it's just a standard methodology or  
23 standard technique to show the five percent damp  
24 spectrum and require that as a design.

25 And then if you actually have a structure

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1 that is, say, ten percent damped, you can convert the  
2 five percent damped to a requirement for a ten percent  
3 damped structure.

4 JUDGE COLE: If it's located on base rock,  
5 what does that do to the damping?

6 DR. MCGUIRE: That's a different  
7 calculation. That's a different calculation. This is  
8 all representing the ground motion at the base rock  
9 level.

10 JUDGE COLE: All right, sir.

11 JUDGE KARLIN: So why did you pick five  
12 percent --

13 DR. MCGUIRE: That's just a standard.

14 JUDGE KARLIN: Oh, that's a standard.

15 DR. MCGUIRE: And I think it actually is  
16 mentioned in reg guide 1.165 as a standard, if my  
17 memory serves me correctly. And it's easy to convert  
18 to other dampings.

19 JUDGE KARLIN: For you maybe.

20 (Laughter.)

21 DR. MCGUIRE: Okay. And then slide 19,  
22 which is my last slide, just shows the horizontal and  
23 vertical SSE spectra at the top and shows the vertical  
24 spectrum, as I indicated earlier, calculated as a  
25 ratio of the horizontal spectrum. It's generally

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1 below the horizontal spectrum except at high  
2 frequencies, where it equals or at some frequencies  
3 actually exceeds the horizontal spectrum.

4 And then we also show here the horizontal  
5 and vertical OBE spectra, which are one-third of --  
6 just calculated as one-third of the horizontal and  
7 vertical SSE spectrum. So that's sort of the final  
8 bottom line here on what we're recommending as the  
9 design spectra for the plant.

10 And that concludes my slides. I'll be  
11 happy to take questions.

12 JUDGE COLE: Well, when we got to 17, you  
13 were going to explain something to me. We were asking  
14 about the difference between 1 times 10-5 and 5 times  
15 10-5. How does that relate to this chart? What would  
16 the chart look like if we had 1 times 10-5 on this?  
17 It would be just higher at the higher frequencies?

18 DR. McGUIRE: Excuse me. I need a little  
19 help.

20 JUDGE KARLIN: The lawyer's going to  
21 provide technical assistance.

22 (Laughter.)

23 DR. McGUIRE: It's not my computer. It's  
24 not my computer.

25 JUDGE KARLIN: All right.

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1 DR. MCGUIRE: I think your question  
2 related to how did the final recommendation compare to  
3 the 5 times 10-5 mean?

4 JUDGE COLE: Yes.

5 DR. MCGUIRE: Is that correct?

6 JUDGE COLE: Well, we're concerned about  
7 the reg guide 1.165. We had recommended using a  
8 frequency of 1 times 10-5.

9 DR. MCGUIRE: Median, yes.

10 JUDGE COLE: Yes, median. And you, in  
11 fact, used a mean value of 5 times 10-5, --

12 DR. MCGUIRE: That's correct.

13 JUDGE COLE: -- which provides you with a  
14 reduced spectral curve, for whatever reason. What  
15 would the curve look like if you were to use the 1  
16 times 10-5?

17 DR. MCGUIRE: If I had used the median --

18 JUDGE COLE: Yes, yes.

19 DR. MCGUIRE: -- 1 times 10-5, the  
20 spectrum would have been higher. I don't know how  
21 much higher.

22 JUDGE COLE: And would that have created  
23 problems?

24 DR. MCGUIRE: Well --

25 JUDGE COLE: I mean, why did we go through

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1 the exercise of justifying the use of the 5 times 10-5  
2 if the reg guide recommended 1 times 10-5?

3 DR. McGUIRE: We recommended the 5 times  
4 10-5 mean because it's very similar to the  
5 performance-based spectrum. And that was developed  
6 first and indicated that on a performance basis, that  
7 was an appropriate performance-based design that would  
8 achieve more conservatism than 25 existing plants in  
9 terms of seismic core damage frequency. And that's  
10 the basis for recommending this spectrum.

11 JUDGE COLE: Now, these 25 plants you're  
12 talking about, the 1 times 10-5 is based on 29 plants?

13 DR. McGUIRE: Yes.

14 JUDGE COLE: Is this a different 25 or is  
15 this --

16 DR. McGUIRE: Some are the same. Some are  
17 different. These are 25 plants at which a seismic  
18 probabilistic risk assessment had been done in the  
19 1980s and a very detailed assessment of the seismic  
20 performance of those plants. And so those results are  
21 summarized in NUREG 1742. And the critical figure is  
22 included in the ESP application as figure 2.5-52.

23 JUDGE COLE: So because this almost  
24 mirrors the spectral image of your initial technique,  
25 which was -- how did you describe it? The

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1 performance-based?

2 DR. MCGUIRE: Performance-based spectrum,  
3 yes.

4 JUDGE COLE: Do you feel confident that  
5 this is reasonably safe?

6 DR. MCGUIRE: Absolutely. And there are  
7 two other points I would like to make.

8 JUDGE COLE: All right, sir.

9 DR. MCGUIRE: One is that the current  
10 techniques for calculating seismic hazard have changed  
11 since these calculations were done in 2003. Both of  
12 those changes would reduce the hazard curve for North  
13 Anna. One of those changes is so-called cumulative  
14 absolute velocity evaluation, which recognizes that  
15 very small magnitude earthquakes have less capability  
16 of damaging engineered structures.

17 JUDGE COLE: All right, sir.

18 DR. MCGUIRE: And second is a new set of  
19 standard deviations on the ground motion equations  
20 that would reduce the hazard from those 2003 EPRI  
21 ground motion equations. Both of those changes, the  
22 staff has indicated they would accept those changes in  
23 new applications. We have not gone back and retrofit  
24 the hazard curves for North Anna, but if we did, those  
25 would come down to substantial --

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1 JUDGE COLE: I don't recall reading that  
2 in any of the filings before us.

3 DR. MCGUIRE: No, they were not applied in  
4 the filings for -- if you mean Clinton and Grand Gulf,  
5 that is correct. Those are new developments developed  
6 by the nuclear industry and new reports. But the  
7 staff has indicated they would accept both of those  
8 changes in future applications, but those have not  
9 been applied here. So all of the hazard curves and  
10 the spectra I have shown you where with respect to  
11 those changes would be conservative, reduce the  
12 spectra further. And that is what gives me confidence  
13 these are adequately conserved as spectra.

14 JUDGE COLE: Thank you.

15 JUDGE KARLIN: Dr. Elleman, anything?

16 JUDGE ELLEMAN: I have no questions.

17 JUDGE KARLIN: Okay. Dr. Lettis, did you  
18 have something that needed to be added?

19 DR. LETTIS: Yes. I just wanted to add  
20 one point of clarification regarding reg guide 1.165  
21 because I don't want to leave a mistaken impression  
22 that we somehow didn't comply with the reference  
23 probability of 1 times 10<sup>-5</sup> median.

24 The reg guide 1.165 acknowledges,  
25 implicitly acknowledges, that this is a moving target,

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1 the reference probability. They provide a standard.  
2 They provide an approved procedure for updating and  
3 revising the reference probability within that reg  
4 guide to accommodate new information.

5 So our approach in redefining the  
6 reference probability is an acceptable approach and  
7 strategy and is actually encouraged in reg guide 1.165  
8 to be technically correct. We want to use the most  
9 current information to establish the reference  
10 probability. And so when we keep harping back on you  
11 are not complying with the standard 1.165 reference  
12 probability of 1 times 10<sup>-5</sup>, that was developed back  
13 in the mid 1990s. The reg guide explicitly  
14 acknowledges that the reference probability will need  
15 to be updated as more information becomes available.

16 JUDGE KARLIN: Right, right. The way I  
17 understand that, the reg guide establishes a reference  
18 probability. The reg guide says that the reference  
19 probability can be updated. It's not updated on an  
20 individual case-specific basis.

21 It's updated by the staff from time to  
22 time. It has not been updated. And, therefore, what  
23 you are asking for is a variance or something that is  
24 different from the current reg guide.

25 I understand that additional data can be

1 used and you have asked for one. You have justified  
2 it. You have given us information. But to tell me  
3 that it's compliant with the reg guide, reference  
4 probability -- and there is one reference probability  
5 right now, and it doesn't need it.

6 DR. LETTIS: With all due respect, the reg  
7 guide allows the applicant to revise the reference  
8 probability.

9 JUDGE KARLIN: It allows for the applicant  
10 to seek something other than the reference  
11 probability. That is what you are doing. And that is  
12 what the staff has approved. Okay.

13 We don't have any other questions. Mr.  
14 Lewis, do you all have any clarifying questions?

15 MR. LEWIS: No, no clarifying questions.

16 JUDGE KARLIN: Okay. It is now 12:30  
17 approximately. We have a couple of options maybe I  
18 should discuss with my colleagues. We were hoping,  
19 actually, we might be able to get finished with the  
20 entire proceeding before we all head off to a lunch  
21 and come back in an hour and 15 minutes.

22 I'm thinking, I think we were thinking  
23 that maybe the remainder, which involves three legal  
24 questions that I don't think we need a huge amount of  
25 oral argument or discussion on and a couple of other

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1 matters can be done in maybe a half an hour or perhaps  
2 less.

3 So, with that in mind, I would suggest  
4 that we might take a short five, ten-minute quick  
5 break and then get back here and finish up here before  
6 we all go off for the day. Would that be acceptable?  
7 Parties, are you all right? Can you hang in here?  
8 All right. Then that is what we will do.

9 We want to thank the panel for your  
10 effort. I'm sorry, Dr. Davie, that you didn't get a  
11 chance in the bull pen. But, you know, you have had  
12 a lucky day, I guess, or something. Thank you all for  
13 your time and preparation. We will let you go.

14 (Whereupon, the witnesses were excused.)

15 JUDGE KARLIN: Let's adjourn. It's 12:34.  
16 Let's reconvene at 12:45. Is that ten minutes? And  
17 then we'll go get done. Thank you.

18 (Whereupon, the foregoing matter went off  
19 the record at 12:34 p.m. and went back on the record  
20 at 12:47 p.m.)

21 JUDGE KARLIN: Please be seated. Okay,  
22 we're now back on the record of the evidentiary  
23 hearing before the Atomic Safety Licensing Board  
24 hearing on the Dominion's application for an early  
25 site permit at North Anna. While we spent two and a

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1 half days listening to a variety of experts and  
2 witnesses concerning matters and having the Judges ask  
3 questions in this uncontested mandatory hearing, these  
4 are interesting and different animals for those  
5 lawyers among us and judges who generally expect the  
6 lawyers to do all the work asking the questions and  
7 the lawyers have gotten a free ride for two and half  
8 days and now they get their 15 minutes of glory to  
9 address three legal questions that we pose.

10 I see you've changed your seating over  
11 there. Is Mr. Biggins in the hot seat on this one?

12 MR. BIGGINS: I am.

13 JUDGE KARLIN: Oh, very good. Gee,  
14 they've delegated this to you. With that, what we'd  
15 like to do is cover, you know, these three items.  
16 They're in the nature of legal questions. I'm not  
17 sure we really expect oral argument for these two to  
18 fight it out amongst themselves. I'm not sure how  
19 much diversity we'll get on that but -- and then we  
20 have several other sort of housekeeping, closing  
21 matters we will talk about. With that, we had asked  
22 three questions that we would like to address.

23 One of them, the first is environmental  
24 justice, whether the Commission's environmental policy  
25 was met and how it was met. We asked a question about

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1 this in our environmental questions and I think, Mr.  
2 Biggins, you're going to address this.

3 MR. BIGGINS: That's correct.

4 JUDGE KARLIN: It was question number --  
5 what, Environmental Question Number 25, right. And if  
6 you can help me with this and us with this. The  
7 Environmental Justice Policy of the Nuclear Regulatory  
8 Commission was issued August 24<sup>th</sup> of '04 and in the  
9 Federal Register I find that there's basically a  
10 guidance as to how the Environmental Justice Policy  
11 should apply. And it says, "If the percentage in the  
12 impacted area significantly exceeds that of the state  
13 or county percentage for either the minority or low  
14 income populations, then Environmental Justice will be  
15 considered in greater detail", sort of your basic if,  
16 then proposition.

17 And my first -- hopefully, you can address  
18 how you interpret that because the answer to the  
19 question 25 seemed to say, "Yes, the if part of that  
20 equation is triggered. Yes, the low income and  
21 minority populations in the impacted area do exceed  
22 the prescribed levels", but the second part of the  
23 answer seems to say, "But we did not do a more  
24 detailed environmental study". Could you help us with  
25 that?

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1 MR. BIGGINS: I certainly can address  
2 that, Judge, but before I begin, I should point out  
3 that I will be addressing Environmental Justice and my  
4 colleague Mr. Weisman will be addressing the second  
5 two issues.

6 JUDGE KARLIN: Okay, go ahead.

7 MR. BIGGINS: The policy statement, as you  
8 pointed out, does say that and create an if/then  
9 criteria essentially setting a criteria level in order  
10 to do a greater detailed analysis. That is the  
11 wording that the statement uses. However, the policy  
12 statement does not disregard staff guidance and it  
13 points that out. Rather it seeks to clarify the  
14 Commission's Environmental Justice Policy by combining  
15 the NRR and NMSS guidance to provide consolidated  
16 agency review. The policy statement clarifies the NRR  
17 and NMSS staff guidance will continue to be used.

18 And in this situation, the staff did apply  
19 the NRR guidance. I should point out that the  
20 specific greater detail language is found in that  
21 policy statement. It is not specifically found in the  
22 NRR guidance. It is found in the NMSS guidance and  
23 NMSS being the Office of Nuclear Materials, Safety and  
24 Safeguards.

25 JUDGE KARLIN: Well, let me ask you, which

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1 one trumps, the policy or the NRR guidance?

2 MR. BIGGINS: The policy statement is very  
3 clear that it does not replace the guidance.

4 JUDGE KARLIN: But if it's inconsistent  
5 any way, which one trumps?

6 MR. BIGGINS: I believe that they are not  
7 inconsistent and the policy statement makes clear that  
8 it is essentially a restatement of the guidance and on  
9 issues where the policy statement is silent, the  
10 guidance will control. So --

11 JUDGE KARLIN: But you didn't answer my  
12 question. If they're inconsistent, which one trumps?

13 MR. BIGGINS: Well, I --

14 JUDGE KARLIN: If they're inconsistent,  
15 which one trumps, the policy by the Commission or the  
16 NRR guidance?

17 MR. BIGGINS: I believe --

18 JUDGE KARLIN: Clearly the policy by the  
19 Commission; is that correct? Would you agree with me?

20 MR. BIGGINS: And a straightforward answer  
21 to that is, I believe if an inconsistency were found,  
22 the policy statement would trump.

23 JUDGE KARLIN: Okay, so proceed.

24 MR. BIGGINS: In this situation, the  
25 responses to the questions are technically correct,

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1 meaning that they are correct, and specifically the  
2 staff did find calculations that met the threshold  
3 criteria. And I don't believe you have any question  
4 about that.

5 JUDGE KARLIN: Yes, I saw that.

6 MR. BIGGINS: Okay, secondly, the staff  
7 did conduct a greater level of scrutiny and look at  
8 the impacts on those populations. And if I may point  
9 your attention to the language of our response and the  
10 question itself, I believe I can provide the  
11 clarification that you're looking for.

12 JUDGE KARLIN: Okay, I'm looking at your  
13 answers. There was a Subpart A and a Subpart B.

14 MR. BIGGINS: And Subpart C, and starting  
15 with Subpart A, you specifically asked are there  
16 populations and I suppose in a roundabout way we said,  
17 yes.

18 JUDGE KARLIN: Right, in a roundabout way.

19 MR. BIGGINS: There certainly are  
20 populations.

21 JUDGE KARLIN: Right.

22 MR. BIGGINS: So the threshold criteria  
23 have been met in finding the populations. There are  
24 populations. Your question, if the answer to A is  
25 yes, then is the EJ analysis at pages 2-76 to 2-77

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1 supposed to represent an Environmental Justice Review  
2 in greater detail? We said, no, and we said no  
3 because pages 2-76 and 2-77 are not the totality of  
4 our Environmental Justice Review. Rather, those  
5 specific pages refer to how we located and identified  
6 the populations.

7 There are additional pages in the FEIS  
8 which do discuss the greater detailed analysis  
9 although, as I pointed out, the NRR guidance, we  
10 didn't use those -- that specific term "greater  
11 detailed analysis".

12 JUDGE KARLIN: So if I understand you  
13 right, you're saying, yes, if then -- if is true, yes,  
14 if that is triggered, but you're saying this is an  
15 analysis in greater detail.

16 MR. BIGGINS: That's correct.

17 JUDGE KARLIN: And the two pages -- we've  
18 got two pages on Environmental Justice, and you're  
19 saying there are other pages in the FEIS that deal  
20 with environmental justice?

21 MR. BIGGINS: Staff conducted its detailed  
22 analysis for the identified populations as explained  
23 in the staff's responses to Environmental Questions  
24 25A, B and C found in Exhibit 10. Page 2-76 to 2-79  
25 of the FEIS contain details of the process used to

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1 identify the populations meeting the guidance  
2 threshold criteria.

3 JUDGE KARLIN: Hold on one second. 2-76,  
4 that's what we cited.

5 MR. BIGGINS: Right, through 2-79.

6 JUDGE KARLIN: Yeah, 2-76, 2-77 and  
7 there's some narrative discussion and then we've got  
8 a map on 2-78 and 2-79. Okay.

9 MR. BIGGINS: And they are discussing the  
10 identification --

11 JUDGE KARLIN: Four pages.

12 MR. BIGGINS: -- of the populations.

13 JUDGE KARLIN: UH-huh, yes.

14 MR. BIGGINS: Other pages of the FEIS  
15 provide a greater detail of the Environmental Justice  
16 Impacts Analysis. Specifically, greater details of  
17 the analysis are found beginning on pages 4-36, 5-52,  
18 and 7-7 of the FEIS.

19 JUDGE KARLIN: Now, let's just go to one  
20 of those and see what we're talking about. 4-36,  
21 Environmental Justice Impacts, okay. We got one, two-  
22 thirds of one page. Okay.

23 MR. BIGGINS: Correct.

24 JUDGE KARLIN: What else?

25 MR. BIGGINS: That was --

1 JUDGE KARLIN: What's the next one?

2 MR. BIGGINS: That was 4-36, 5-52.

3 JUDGE KARLIN: 52, okay. "Environmental  
4 Justice refers to a federal policy in which each  
5 federal agency identifies -- the Commission issued a  
6 policy, the staff identified pathways. The staff then  
7 evaluated minority and low income populations, could  
8 be disproportionate to the impact effected. The  
9 December 2003 review, the staff interviewed -- no  
10 unusual resource" -- that's the in-depth review?

11 MR. BIGGINS: Well, it's certainly part of  
12 it, your Honor.

13 JUDGE KARLIN: Okay. Keep going. What's  
14 the next one?

15 MR. BIGGINS: And the next one is 7-7.  
16 "Additionally, Environmental Justice considerations of  
17 the NEPA alternative sites" --

18 JUDGE KARLIN: Hold on a second. Are you  
19 suggesting --

20 MR. BIGGINS: -- are found on other pages  
21 as well.

22 JUDGE KARLIN: You're suggesting that this  
23 is a greater detailed Environmental Justice Analysis?

24 MR. BIGGINS: Certainly.

25 JUDGE KARLIN: Okay. Keep going. That's

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1 all we need to know, I guess.

2 MR. BIGGINS: Well --

3 JUDGE KARLIN: You posit it that the  
4 Environmental Justice Policy was triggered and that  
5 you have provided Environmental Justice analysis in  
6 greater detail in this FEIS.

7 MR. BIGGINS: The staff conducted a  
8 greater level of analysis. I would point out that --

9 JUDGE KARLIN: What would be one if you  
10 didn't have -- this is greater detail. What's the  
11 lesser detail? Can you show me -- maybe we should  
12 look at a few FEIS' where there wasn't triggered and  
13 see if it's any difference in length. Have you done  
14 that?

15 MR. BIGGINS: I believe what you're asking  
16 is, if this is greater detail, would you a lesser  
17 level of detail be?

18 JUDGE KARLIN: Right.

19 MR. BIGGINS: And I believe the policy  
20 statement itself addresses that. And the policy  
21 statement says that if the percentage of the impacted  
22 area significantly exceeds that of the state or the  
23 county percentage for either the minority or low  
24 income population then Environmental Justice will be  
25 considered in greater detail. That's the section that

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1 you focus on.

2 JUDGE KARLIN: Right.

3 MR. BIGGINS: The NMSS guidance where that  
4 language came from, points out -- provides an  
5 explanation. "If the percentage in the block group  
6 significantly exceed that of the state or county  
7 percentage for either minority or low income  
8 population, Environmental Justice will have to be  
9 considered in greater detail. Additionally, if either  
10 the minority or low income population percentage  
11 exceeds 50 percent, Environmental Justice will have to  
12 be considered in greeter detail".

13 Now, the NMSS continues in that it says,  
14 "If no minorities or low income populations are  
15 identified in the potentially effected area, or  
16 environmental impact area, then document the  
17 conclusion. The Environmental Justice Review is  
18 complete". And it states that and I believe that the  
19 policy statement clarifies that the Commission  
20 believes that the NEPA review has always provided a  
21 baseline Environmental Justice Review and the specific  
22 part of the policy, I'll paraphrase, "as part of  
23 NEPA's original mandate, agencies are required to look  
24 at the socioeconomic impacts that have a nexus to the  
25 physical environment. It is the Commission's view

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1 that the obligation consider and assess  
2 disproportionately high and adverse impacts on low  
3 income and minority populations as part of its NEPA  
4 review was not created by the Executive Order. Rather  
5 is it the Commission's view that such an analysis is  
6 appropriate in its normal and traditional NEPA review  
7 process".

8 JUDGE KARLIN: So is this a normal and  
9 traditional Environmental Justice Review or is this  
10 the greater detailed Environmental Justice Review?

11 MR. BIGGINS: This is the greater detailed  
12 Environmental Justice Review --

13 JUDGE KARLIN: Okay.

14 MR. BIGGINS: -- because this review  
15 following the NRR guidance, specifically Steps 4 and  
16 5 of the NRR guidance, require --

17 JUDGE KARLIN: What's the citation on the  
18 NRR guidance?

19 MR. BIGGINS: The NRR guidance is -- it is  
20 cited in the policy statement but it is LIC-203  
21 Revision 1, Appendix D. And I can provide the ADAMS  
22 number as well if you --

23 JUDGE KARLIN: No, I think we can get  
24 that. Okay.

25 MR. BIGGINS: That is an office

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1 instruction for the NRR.

2 JUDGE KARLIN: And office instruction,  
3 what does that mean?

4 MR. BIGGINS: It's their internal guidance  
5 for --

6 JUDGE KARLIN: Guidance, okay.

7 MR. BIGGINS: -- that office, correct.

8 JUDGE COLE: You'd better get the ML  
9 number.

10 JUDGE KARLIN: All right, what's the ML  
11 number?

12 MR. BIGGINS: That would be ML 03355003,  
13 pardon me, 0003.

14 JUDGE KARLIN: All right, three zeros and  
15 then a 3.

16 MR. BIGGINS: Correct.

17 JUDGE KARLIN: Okay.

18 MR. BIGGINS: And in that guidance, Steps  
19 4 and 5 require first an examination of potentially  
20 significant environmental impacts to minority or low  
21 income populations. Then a determination of whether  
22 here are disproportionately high and adverse human  
23 health or environmental effects on the identified  
24 populations.

25 So in looking at the policy statement

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1 together with the NRR guidance, there is no set  
2 procedure for conducting an -- well, let me rephrase  
3 that.

4 There are no specific steps to follow for  
5 conducting an Environmental Justice Review if you do  
6 not meet that threshold criteria. In other words, the  
7 threshold criteria used to identify minority or low  
8 income populations triggers Steps 4 and 5 of the  
9 guidance. Without that, the lower level of review  
10 would simply be the environmental justice factors that  
11 are intrinsically part of the NEPA review process. So  
12 in this case, we -- staff did conduct a review which  
13 incorporated Steps 4 and 5 and documented their  
14 findings and conclusions in the FEIS and therefore,  
15 complied with the policy statement as well as the NRR  
16 guidance.

17 JUDGE KARLIN: So it's your position that  
18 under the policy the requirement to conduct an  
19 Environmental Justice Review in greater detail was  
20 triggered and that the staff's FEIS is an  
21 Environmental Justice Review in greater detail.

22 MR. BIGGINS: That's correct.

23 JUDGE KARLIN: Okay, thank you. Is there  
24 anything more? That's about all we need.

25 MR. BIGGINS: That's all I have for your

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1 consideration of this matter, and I'd be happy to  
2 answer any other questions you may have.

3 JUDGE KARLIN: Any questions? No. Now,  
4 do you want to oppose that, Mr. Lewis?

5 MR. LEWIS: No, I'd add a few comments.  
6 I agree with the analysis. Basically, the  
7 Environmental Justice Process is a two-step review.  
8 The first step is to determine whether there are any  
9 low income or minority populations in the impact area.  
10 If there are none identified, that is the end of the  
11 review. The greater detail requirement is in  
12 contrast to that statement. If you determine there  
13 are populations, you say there are none, end of story.  
14 Greater review --

15 JUDGE KARLIN: Now, wait a second, didn't  
16 I just hear Mr. Biggins saying that even before the  
17 Environmental Justice Policy and Executive Order came  
18 out, the NRC thought that you had to do an  
19 Environmental Justice Analysis under NEPA anyway.  
20 Didn't he just say that?

21 MR. LEWIS: I'm not disagreeing with that.  
22 I'm just talking about the process. This is the  
23 process.

24 JUDGE KARLIN: So if you had to do an  
25 Environmental Justice Review prior -- you know,

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1 anyway, then how can simply saying it's not triggered,  
2 end of story be sufficient?

3 MR. LEWIS: Because if doing an  
4 Environmental Justice Review, if your initial step is  
5 there are no minority or low income populations,  
6 there's nobody to be impacted and there is no further  
7 need for analysis.

8 JUDGE KARLIN: Not necessarily. There  
9 could be 49 percent instead of 50. There's just a  
10 greater detailed review required by the policy.

11 MR. LEWIS: No, the --

12 JUDGE KARLIN: Are you saying there's  
13 absolutely no Environmental Justice Review is needed  
14 prior to the policy?

15 MR. LEWIS: If the -- there were  
16 Environmental Justice Reviews prior to the policy.  
17 The policy and the guidance before has explained how  
18 to do that. The NRC and this criteria of 20 percent,  
19 50 percent actually comes from other documents as well  
20 as an EPA criteria if my recollection is correct.  
21 That has been used as a screening criteria, an initial  
22 to and the general presumption is you look at the  
23 impact area to determine whether you have low income  
24 and minority populations. If these screening criteria  
25 are not exceeded, you simply document that in the

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1 normal course and move on.

2           And therefore, there is no further  
3 analysis. The statement about analyzing these impacts  
4 in greater detail simply means that if you do identify  
5 minority and low income populations above the  
6 thresholds, then you have to do further analysis.  
7 That is exactly what the NRC staff did here. After  
8 identifying that there were some segment blocks that  
9 had low income and minority populations even though  
10 they were far away but within the 50-mile zone. The  
11 NRC staff then looked at all the different pathways  
12 that might effect those populations.

13           They determined that there were no  
14 pathways that would have a disparate adverse, large  
15 adverse disparate impact on those populations. What  
16 the NRR guidance says and what the CEQ regulations say  
17 that in those circumstances where you have looked at  
18 an impact and determined that it is small, you  
19 document that result as concisely as possible. In  
20 particular the NRR guidelines say if you conclude that  
21 there are no significant adverse disproportionate  
22 impacts, document that as concisely as possible, as  
23 long as it's understandable.

24           The CEQ regulations have long held that  
25 where you determine that an impact is small, you

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1 should make your statement as concise as possible.  
2 You don't write volumes.

3 JUDGE KARLIN: Right, right.

4 MR. LEWIS: I think it's a mistake to  
5 equate the fact that there's just a few pages  
6 addressing this subject with the presumption that that  
7 means the NRC staff did not look at it in greater  
8 detail. They looked at it in greater detail. The  
9 results though, were that there were no significant  
10 adverse large impacts on these populations. Once they  
11 reached that determination their only obligation in  
12 the FEIS was to document the results in an  
13 understandable way as concisely as possible and that's  
14 exactly what they did.

15 JUDGE KARLIN: Well, is there not an  
16 obligation in the draft Environmental Impact Statement  
17 to put out for public comment information about the  
18 Environmental Justice Review which would allow the  
19 reasonable public comment and review of that.

20 MR. LEWIS: I believe they did. I think  
21 their draft Environmental Impact Statement mirrored  
22 what was in the final Environmental Impact Statement.

23 JUDGE KARLIN: I haven't seen it.

24 MR. LEWIS: It identified the populations.

25 JUDGE KARLIN: Do you know whether the

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1 ESPs for the other two ESPs triggered the greater  
2 detail Environmental Review under the Environmental  
3 Justice policy or not? I don't know.

4 MR. LEWIS: I don't know either. I'm  
5 sorry, I did not go and look at those other EIS'.

6 JUDGE KARLIN: Does the staff know?

7 MR. BIGGINS: I don't know that. It's  
8 possible that --

9 JUDGE KARLIN: Would it be worth looking  
10 at those to see if it is and see if there's a  
11 difference? I understand length is not the sole  
12 criteria. We've read it. I've read it. I don't  
13 think there's much detail there. It doesn't matter  
14 what the pages are but would it be useful to look at  
15 those other two and see if --

16 MR. BIGGINS: We have Dr. Scott available  
17 here and he says that, yes, the other cases did have  
18 a greater detailed analysis.

19 MR. LEWIS: Okay, so those would appear  
20 similar. To have a comparative point, we'd have to  
21 find some where it was not triggered. Is that what --  
22 that's what I'm thinking. But okay.

23 MR. LEWIS: If you did do that comparison,  
24 of course, how much description in the EIS would  
25 depend on what are the pathways and whether they

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1 actually had the ability to impact them and generally  
2 what you see is --

3 JUDGE KARLIN: And how much review. I  
4 mean, you need to do a review, study the area, see  
5 what kind of possible vectors, pathways, you know,  
6 food consumption that sort of thing, might be  
7 occurring.

8 MR. LEWIS: That is correct, and that's  
9 exactly what's described in this SIS.

10 JUDGE KARLIN: I see some information on  
11 that, yes.

12 MR. LEWIS: What you might find at another  
13 site though, is that you have minority populations  
14 that live in very close proximity to a plant where  
15 they're actually effected -- you know, they may have -  
16 - the classic example is subsistence level fishing in  
17 a body of water immediately adjacent to a plant, then  
18 they might be specifically effected. In this case,  
19 you were looking at populations that were, I think the  
20 low income populations, the closest approach was 20  
21 miles and the minority populations were farther out  
22 than that. They weren't close and there weren't  
23 obvious pathways but the NRC staff nevertheless looked  
24 to determine whether there were vectors, whether there  
25 were ways that would impact them and I would submit to

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1 you that the only reason the analysis is written  
2 briefly in here is that the results were negative and  
3 there were no significant impacts.

4 JUDGE KARLIN: Okay. That's great. Let's  
5 move to the next legal question, if we may. Let's  
6 see. And this is probably more informational than any  
7 kind of argumentation issue. That we noted that the  
8 new Part 52 regs have been issued. They haven't  
9 actually appeared in the Federal Register unless they  
10 came out today. But we had earlier asked you all  
11 questions about two problems I had and we had. As you  
12 will remember when these early site permit regulations  
13 were issued back on April 18<sup>th</sup>, 1989, there was a  
14 concern raised by the Connecticut Siting Council and  
15 Environmental Group raising concerns about ESPs and  
16 their long 20-year length and the fact that adequate  
17 information might not be available to sort of bank all  
18 environmental issues for 20 years.

19 And the Commission said, "Look, we're not  
20 going to issue partial environmental early site  
21 permits. There's a separate mechanism for that. It's  
22 called, you know, Subpart Q and there's Appendix Q.  
23 So we're not going to issue partial and early site  
24 permits and we're not going to issue early site  
25 permits where -- unless the exact operational

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1 parameters are provided." So we were concerned about  
2 that.

3 But that's a long time ago, maybe there's  
4 something new that's come out. So what I was thinking  
5 is perhaps you could just generally tell us if there's  
6 any information that might inform our decision, it's  
7 not going to control it, in the new regs. And if so,  
8 perhaps give us some citations. But we can't get  
9 citations now because the Federal Register isn't out.

10 MR. WEISMAN: Here's the status.

11 JUDGE KARLIN: What's the scoop?

12 MR. WEISMAN: The status of the rulemaking  
13 is that on April 11<sup>th</sup>, 2007 the Commission issued a  
14 staff requirements memorandum which requires the staff  
15 to prepare the rule for publication in the Federal  
16 Register and then it will become final. It takes some  
17 time to do that.

18 JUDGE KARLIN: Right.

19 MR. WEISMAN: The staff -- my  
20 understanding is the staff currently anticipates  
21 finishing that preparation some time near the end of  
22 May, something like that.

23 JUDGE KARLIN: Oh, I see, so it's a long  
24 time.

25 MR. WEISMAN: That rule then must go to

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1 OPM for review and the Commission may need to address  
2 OPM comments on that. Did I say -- OMB, I'm sorry,  
3 OPM, OMB, excuse me. The Office of Management and  
4 Budget. And if -- once the Commission addresses  
5 those, then it will be published in the Federal  
6 Register. So I guess we would anticipate a matter of  
7 some months --

8 JUDGE KARLIN: Okay.

9 MR. WEISMAN: -- before the rule is  
10 published in the Federal Register. Now, having said  
11 that, and I'm sure -- does your Honor -- do you need  
12 the ML number for the SRM? I'll be happy to give it  
13 to you.

14 JUDGE KARLIN: Yeah, sure.

15 MR. WEISMAN: Sure. It's ML 071010223.

16 JUDGE KARLIN: Okay.

17 MR. WEISMAN: All right, and that SRM does  
18 not, in my view, appear to address the issues that  
19 you're raising. The SRM is on a SECY paper that the  
20 Commission -- the staff sent to the Commission in  
21 October of 2006 which transmitted what the staff was  
22 proposing for the new Part 52 Rule.

23 There is some lengthy discussion in the  
24 SECY Paper on environmental review and how that will  
25 work. That's SECY 06-0220, the ML number is 062910203

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1 and I believe that discussion on a COL referencing an  
2 ESP begins at page 272 of the SECY paper -- or not the  
3 SECY paper but the attachment to the SECY paper, which  
4 is the staff's proposed Federal Register Notice.

5 I'm not sure how much that will really  
6 inform your view. There certainly -- there are some  
7 changes that are -- that's going to be made to that  
8 section in view of the SRM.

9 JUDGE KARLIN: Well, I was just -- I'm --  
10 I guess that's very helpful because I thought  
11 something was eminent in that if we were thinking of  
12 issuing a decision in the next month or so, you know,  
13 that there would be something in the Federal Register  
14 that we could read and might be relevant, but  
15 apparently that ain't going to happen.

16 MR. WEISMAN: That's not going to happen.

17 JUDGE KARLIN: Okay, and I guess you're  
18 saying there's nothing that you foresee that is going  
19 to be a dias ex machina that's going to solve this  
20 problem or make a big change that would be relevant.

21 MR. WEISMAN: I don't think so. I mean,  
22 my view is that the rule reflects the staff's current  
23 -- understanding of the current rule insofar as the  
24 staff will get an opportunity to consider the  
25 significance of any new information that is available

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1 at the COL stage.

2 JUDGE KARLIN: Has the mechanism for -- I  
3 mean, before early site permits were created in the  
4 regulatory regime in Part 52, as I understand it,  
5 there was a separate mechanism for getting early  
6 partial site suitability decisions made.

7 MR. WEISMAN: That's correct, your Honor.

8 JUDGE KARLIN: And that still exists in  
9 the regs now.

10 MR. WEISMAN: Yes, it does.

11 JUDGE KARLIN: A mechanism to get an early  
12 site suitability approval from the NRC for partial  
13 environmental site suitability issues.

14 MR. WEISMAN: Yes, that has --

15 JUDGE KARLIN: Is that going to be deleted  
16 by virtue of the new Part 2 or is that --

17 MR. WEISMAN: No, that's -- you're  
18 referring to the procedural part of the rule as 20 CFR  
19 Section 2.101(a-1).

20 JUDGE KARLIN: And is it like Part 2,  
21 Subpart 700 series, I think, or 800 series? There's  
22 some procedural regs there. But okay, it hasn't been  
23 deleted.

24 MR. WEISMAN: Yeah, it has not been  
25 deleted.

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1 JUDGE KARLIN: Okay. All right. All  
2 right, well, then that moots that question. I think  
3 that helps us out. Anything you have to add?

4 MR. LEWIS: Yes, Judge Karlin, in looking  
5 through the SECY paper and looking at the SRM to see  
6 what changed, there were some potentially useful  
7 statements in the SECY paper which looked like the  
8 Commission had not changed by the SRM and therefore,  
9 I presume will be in the final rule and I think will  
10 signify the Commission's intent on the scope of an  
11 Environmental Review in an ESP proceeding. And I  
12 would just refer them -- it is a little hard trying to  
13 take SRM and look where the changes are but we tried  
14 and we didn't see any changes to these particular  
15 sections.

16 But in the SECY paper, SECY 06-0220, at  
17 page 281 to 282, the Commission -- the SECY paper says  
18 and presumably the Commission's final SOC will say,  
19 "The NRC is making additional changes to 5151(b) to  
20 further clarify the scope of Environmental Review at  
21 the early site permit stage". So I view this  
22 statement as we're clarifying what is intended now.

23 And skipping over a couple of sentences,  
24 they say, "The purpose of this change is to clearly  
25 delineate that the scope of the Environmental Review

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1 at the early site permit stage is at a minimum, to  
2 address all issues needed for the NRC to perform its  
3 evaluation of the alternative sites. In addition, the  
4 Applicant may choose to address one or more issues  
5 related to construction or operation of the facility  
6 with the goal of achieving finality on those issues at  
7 the early site permit stage."

8 That same statement is repeated several  
9 other times in the SECY Paper and to me, signifies  
10 what the Commission is saying is what is really  
11 essential is that you look at the effects of  
12 construction and operation that are really essential  
13 for your alternative site reviews. The other ones,  
14 you may address if you want finality but those -- in  
15 that case, it's not essential. And I think that a  
16 good example of that would be some of these field  
17 cycle field generic issues that are going to be the  
18 same for all plats and therefore, can't possibly  
19 effect an alternative site review where there are some  
20 unresolved issues there. Clearly those are not  
21 essential for the selection of alternative sites and  
22 if you accept this statement in the SECY as the  
23 Commission's statement of intent, it would clearly  
24 lead to the conclusion that it's permissible to have  
25 those sort of issues unresolved.

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1           There was also another interesting  
2 statement that is in the response to comments which is  
3 an enclosure to the SECY paper and there it states in  
4 response to a comment, "Rather the Part 52 licensing  
5 model with respect to ESPs and COLs referencing them  
6 is akin to an evaluation of a project at an early  
7 stage with a subsequent evaluation at a later stage as  
8 described in the CEQ regulations at 40 CFR Section  
9 1508.28(B). As indicated in Section 1508.28(B), such  
10 a process is appropriate when it helps agency focus on  
11 those issues that are ripe for decision and exclude  
12 from consideration issues already decided or not yet  
13 ripe. The Commission intends to focus its  
14 environmental reviews in a similar manner".

15           The reference to the CEQ regulation is the  
16 reference to the regulation on tiering and what this  
17 suggests is that the Commission's concept of the ESP  
18 COL process is that you look at what's right but you  
19 don't have to resolve everything at the ESP stage. It  
20 is a tiering process.

21           JUDGE KARLIN: Right, okay. That's  
22 somewhat helpful. Okay.

23           MR. WEISMAN: If I may just offer a brief  
24 response. Certainly, the staff agrees that what is  
25 set out in the Commission -- in the SECY paper is

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1 consistent with the staff's interpretation of the  
2 current rule. But I might offer the caution that the  
3 Supreme Court has frowned upon these post-enactment  
4 legislative statements in interpreting an earlier  
5 statute or rule.

6 MR. LEWIS: I agree but I thought it was  
7 appropriate to look at these simply because the  
8 Commission used the word "clarify", and I view that as  
9 indicating this really is clarifying what we always  
10 intended.

11 JUDGE KARLIN: No one ever changes  
12 anything, they always clarify it.

13 MR. WEISMAN: Of course.

14 JUDGE KARLIN: All right, thank you for  
15 that. I guess it was a little premature, because  
16 those regs aren't going to be out. They wouldn't  
17 strictly have been applicable anyway but I understand  
18 there might have been some preamble that would help.  
19 The third item we've asked the lawyers to address is  
20 something that came up in some of our questioning of  
21 the witnesses, and that was the application of the two  
22 decisions by the Commission in the Clinton and Grand  
23 Gulf ESP. All three of these ESP proceedings have  
24 involved a proposed permit condition and what we call  
25 the zero release permit condition. And so can you --

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1 now is your shot to tell us what it means Mr. Weisman.

2 MR. WEISMAN: Thank you, your Honor. I  
3 think I'm going to -- I'll start by saying that the  
4 Commission recognizes that there is no 100 percent  
5 assurance that no release will occur.

6 JUDGE KARLIN: You think the Commission  
7 recognizes that.

8 MR. WEISMAN: Certainly --

9 JUDGE KARLIN: You believe that.

10 MR. WEISMAN: I believe that and certainly  
11 the statute requires only adequate protection, not 100  
12 percent protection. I believe that the Commission's  
13 modification to the permit condition that was  
14 discussed today would certainly result in adequate  
15 protection and make it clear that 100 percent  
16 protection is not required.

17 Going a little bit further, I think that  
18 focusing on the Clinton decision, there's a little bit  
19 more language in the Clinton decision that's CLI 07-  
20 12, there was clearly before the Commission was the  
21 issue of compliance with 10 CFR Section 100.20(C)(3).

22 JUDGE KARLIN: Uh-huh.

23 MR. WEISMAN: You can look at the staff's  
24 briefs to the Commission. One of them the NRC staff's  
25 response to the Commission's January 22<sup>nd</sup>, 2007 order

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1 that's dated February 1<sup>st</sup>, 2007 and that was in  
2 Clinton and Grand Gulf, the Clinton response at 3 and  
3 4, the NRC staff brief in response to COI-07-07, dated  
4 February 26<sup>th</sup>, 2007, that's in Grand Gulf at 2 to 4.  
5 Clearly, those briefs clearly raise the issue of  
6 compliance with that section. The Commission has  
7 adopted this license, this permit condition as an  
8 approach to satisfying that piece of the regulation  
9 and I think that both the staff and the board are  
10 bound by that.

11 JUDGE KARLIN: Well, let me ask and we  
12 asked this question earlier and perhaps you can help.  
13 The permit language as modified by the staff on 4/10  
14 pursuant to the Commission's two rulings on this  
15 issue, says something to the effect of the any future  
16 reactors must be designed to preclude releases. Now,  
17 let's say Dominion designs it to preclude releases and  
18 they, in fact, anyway have releases.

19 MR. WEISMAN: Yes, your Honor.

20 JUDGE KARLIN: Would there be a violation?

21 MR. WEISMAN: There would not be a  
22 violation of that permit condition. It would --

23 JUDGE KARLIN: So it doesn't mean that  
24 there shall be no releases. It said, there shall be  
25 no releases.

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1 MR. WEISMAN: It will be designed.

2 JUDGE KARLIN: That would be different.

3 MR. WEISMAN: That's right.

4 JUDGE KARLIN: But if they said, you  
5 design it to preclude releases, an actual release may  
6 not be a violation of that condition.

7 MR. WEISMAN: That is correct, your Honor.

8 JUDGE KARLIN: Right, that's kind of the  
9 way I looked at it. So it doesn't really say that  
10 there won't be any releases. It just says, you've got  
11 to make a design to minimize or reduce the probability  
12 of.

13 MR. WEISMAN: To provide adequate  
14 protection against releases.

15 JUDGE KARLIN: To provide adequate  
16 protection, right. So from a safety standard under  
17 the Atomic Energy Act, all that's needed is reasonable  
18 assurance of achieving those protections of human  
19 health.

20 MR. WEISMAN: Yes, your Honor.

21 JUDGE KARLIN: What about from the  
22 environmental perspective? That is to say NEPA  
23 requires -- the syllogism I present is NEPA requires  
24 you to do an analysis of all potential environmental  
25 impacts. Groundwater impact is a potential

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1 environmental impact. It seems like the EIS does not  
2 do an analysis of the environmental impacts of the  
3 operation because they say we don't have to because  
4 there aren't going to be any.

5 MR. WEISMAN: Well, your Honor, I would  
6 address that this way; the staff is required to  
7 evaluate the construction and operation of a reactor  
8 or reactors that might be built on the site. Any  
9 reactor or reactors that might be built on the site is  
10 going to have these features incorporated in it.

11 JUDGE KARLIN: To preclude releases, that  
12 is to reduce the chances of them.

13 MR. WEISMAN: Right, and --

14 JUDGE KARLIN: Right.

15 MR. WEISMAN: -- the staff made the  
16 judgment that in view of the adequate foreseeable  
17 against these releases provided by the design  
18 features, releases having a significant effect on the  
19 environment are not reasonably foreseeable as set  
20 forth in the EIS.

21 JUDGE KARLIN: So are we doing a NEPA  
22 analysis like that the terrorism attack, that it's  
23 remote and speculative that there would be any  
24 groundwater leaks at this facility?

25 MR. WEISMAN: Well, the best estimate of

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1 a release, I think that this is what the FEIS -- my  
2 interpretation of the FEIS, the best estimate is that  
3 there would not be one and under Robertson v. Miho  
4 Valley no further analysis is required.

5 JUDGE KARLIN: Well, I thought the Ninth  
6 Circuit just went through something like this. What -  
7 - is this sort of a magic wand that you could say  
8 well, we have to do an Environmental Impact Statement  
9 of all the environmental impacts that this proposed  
10 facility will have but in lieu of doing that, we'll  
11 just put conditions in that say there will be no  
12 environmental impacts and therefore, we don't have to  
13 look at it and therefore, we can dispense with NEPA.  
14 Is that what's going on?

15 MR. WEISMAN: I don't think so, your  
16 Honor. I think that the most realistic estimate of  
17 what the release will be is that they will be very,  
18 very small. There won't be any releases. That's --

19 JUDGE KARLIN: Well, I appreciate that the  
20 release might be small, might moderate, might be  
21 negligible, that's a good word everybody uses, but it  
22 seems like under NEPA there's a requirement to do an  
23 assessment of the potential environmental impacts to  
24 the various media, groundwater in the soil being one  
25 of those media and would you say that the FEIS has

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1 provided an assessment of the groundwater impacts?

2 MR. WEISMAN: I think that the staff's  
3 statement with respect to --

4 JUDGE KARLIN: Or they just said they  
5 didn't have to do one because it was so improbable.

6 MR. WEISMAN: I think that -- I think you  
7 could probably -- give me just a moment.

8 JUDGE KARLIN: Okay. I mean, maybe that's  
9 a false dichotomy. I'm not sure.

10 MR. WEISMAN: Yeah, I'm not sure that the  
11 staff's analysis as set forth in the EIS can be read  
12 one way or the other but it certainly can be read to  
13 say that that release is not reasonably foreseeable.

14 JUDGE KARLIN: Yeah, I think that's kind  
15 of the way I read it, is well, I'm not sure they used  
16 those words, but they -- on the one hand I could have  
17 -- I would have looked for a section that says,  
18 "Environmental impacts, impacts to groundwater from  
19 leaks and slow leaks and spills. Based upon the  
20 September 2006 report on tritium, we see that it's  
21 found that many sites, many nuclear reactors have  
22 problems with leaks and spills but even assuming they  
23 happened, those impacts would be small and they just  
24 go into the lake, so no problem.

25 The other way is, well, we don't have to

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1 look at it because we've got a permit condition that  
2 says it's never going to happen.

3 MR. WEISMAN: And I think, your Honor,  
4 that -- if I recall correctly, the witnesses testified  
5 that those plants may not include the same kind of  
6 features that are going to be included in these future  
7 plants.

8 JUDGE KARLIN: Right, right. Okay, well,  
9 do you have anything more you want to add on that?

10 MR. WEISMAN: No, your Honor.

11 JUDGE KARLIN: Any other questions, Mr.  
12 Lewis, anything there?

13 MR. LEWIS: Just a couple points. I agree  
14 with Mr. Weisman and in particular I agree that the  
15 Commission approved the condition in the Clinton and  
16 Grand Gulf proceedings, specifically in the context of  
17 satisfying 100.20(c)(3). That was clearly the context  
18 and, therefore, should be viewed as a Commission  
19 determination that, in fact, this condition does  
20 satisfy that provision.

21 With respect to the NEPA analysis, I agree  
22 that their context wasn't NEPA but in a NEPA analysis,  
23 you look at the impacts of normal operation and you  
24 also look at the impacts of accidents. Accidents are  
25 very wide-ranging. You can hypothesize many different

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1 things, and so an agency always looks at a reasonable  
2 range of accidents. They usually look at the ones  
3 that are more significant.

4 And in fact, in the NRC's final  
5 Environmental Impact Statement at 571 where they talk  
6 about accidents, the staff explains, "The term  
7 accident as used in this section refers to any off  
8 normal event not addressed in the section on normal  
9 operations which results in the release of radioactive  
10 material in the environment". And then goes on and  
11 says, "The focus of those reviews is on the event that  
12 could lead to releases substantially in excess of  
13 permissible limits for normal operations".

14 What this is indicating is the staff does  
15 look at impacts. They try and look at the ones that  
16 are significant. They have an Environmental Standard  
17 Review Plan that directs them to the accidents that  
18 they should really evaluate. Traditionally, and in  
19 that ESRP, the focus has always been on design basis  
20 accidents and then more recently additional analysis  
21 of severe accidents. I guess for completeness, I  
22 should say transportation accidents as well.

23 So the Applicant, in this case, Dominion  
24 in their Environmental Report addressed the accidents,  
25 the design basis accidents, that were recommended in

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1 the Environmental Standard Review to be addressed and  
2 they certainly found any slow release into  
3 groundwater. There are much more significant releases  
4 that result in more significant doses. A slow leak  
5 into groundwater is, as the record already shows, is  
6 going to result in a travel time of about 16 years.

7 We have crop detection capability.  
8 There's plenty of time to interdict any release. If  
9 it does go anywhere, it's going to the lake. I would  
10 submit to you that in the big scheme of things, that's  
11 not a particularly significant accident. What the  
12 FEIS did properly is look at the ones that are really  
13 more important and more informative and focused on  
14 those and I think that's completely consistent with  
15 NEPA.

16 JUDGE KARLIN: All right. Any questions  
17 from my colleagues? All right, that's good. Thank  
18 you for helping us with those three issues. I think  
19 we've reached basically the end. There are a couple  
20 of housekeeping matters that I want to --

21 MR. LEWIS: I have only one request, Judge  
22 Karlin.

23 JUDGE KARLIN: Okay, go ahead, what do you  
24 have?

25 MR. LEWIS: There was a question that was

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1 asked at the end of the day yesterday concerning the  
2 alternative sites and specifically there was a  
3 question that had not been reflected or raised earlier  
4 in the Board's written questions and it was, why did  
5 you not consider Dominion's fossil sites. When we  
6 previously were looking at whether we should present  
7 information on the alternative issues, we were guided  
8 by your statement in your last pre-hearing conference  
9 call that we should look at your questions to  
10 understand the parameters of your scope.

11 Your questions had previously focused on  
12 why didn't Dominion and the NRC staff consider nuclear  
13 plants owned by other entities and in addition, why  
14 didn't we consider alternatives involving the  
15 modification of Units 1 and 2. So we did not  
16 anticipate that this new question was going to come up  
17 and we've not had an opportunity to address it.

18 What we would very much like to do is get  
19 the Board's permission to make a submission within 10  
20 days explaining exactly why Dominion's fossil  
21 facilities are not reasonable alternatives that should  
22 even be considered.

23 JUDGE KARLIN: Well, I mean, I tend to say  
24 okay, and I'll consult with my colleagues but is it  
25 beside the point. NRC is the one that complies with

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1 NEPA. You could consider your alternative site till  
2 the cows come home and it wouldn't make any difference  
3 if NRC staff didn't do the consideration of alternate  
4 sites.

5 MR. LEWIS: Surely but if there's, in  
6 fact, a good explanation why these aren't reasonable  
7 or achievable or, you know, not appropriate  
8 alternatives to consider, then the NRC's FEIS' is  
9 complete. And in addition, it's been long-held that  
10 these hearings and proceedings in fact amend and  
11 supplement the NEPA record of decision and amend the  
12 FEIS pro tanto, I think was the phrase that used to be  
13 used, whatever that means. And so I would submit, if  
14 there is a question like this because there are really  
15 on alternative sites, almost a myriad possibilities.  
16 I mean, you could postulate, you know, why didn't you  
17 look at this, why didn't you look that and there's  
18 always something that somebody can ask and so it's  
19 probably the best --

20 JUDGE KARLIN: Well, okay, really I mean,  
21 I think that the focus is what the staff considered.  
22 Dominion, I mean, one option is to remand this matter  
23 to the staff or somehow simply say that the  
24 application is deficient because the NEPA analysis did  
25 not properly cover the alternatives, all the

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1 reasonable range of alternatives. By Dominion  
2 submitting something as to what's reasonable, what  
3 isn't, is that going to change the fact that the draft  
4 EIS didn't cover this, the public didn't get to  
5 comment on it and the staff didn't deal with it on a  
6 final EIS?

7 MR. LEWIS: Certainly the public was fully  
8 informed of the alternatives that were being evaluated  
9 and if any member of the public or any agency thought  
10 an additional site should have been evaluated, they  
11 certainly could have raised it, so there's no issue  
12 here about the public not having been given an  
13 opportunity to address the alternatives.

14 JUDGE KARLIN: Oh, I beg to differ. I  
15 think that they've looked at the three alternative  
16 sites that were put into the box, but I'm not sure how  
17 many comments were made as to others. I just don't  
18 know, but let me just confirm with my colleagues.

19 MR. LEWIS: Well, let me just before you  
20 do again, again, if these sites are -- let me explain  
21 on an alternative site. Fossil plants are typically  
22 not located --

23 JUDGE KARLIN: No, no, you're okay, come  
24 on.

25 MR. LEWIS: Okay.

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1 (Pause)

2 JUDGE KARLIN: All right, we'll grant that  
3 request, what 10 days and 10 pages? How many pages?  
4 Ten pages.

5 MR. LEWIS: Okay, I do have --

6 JUDGE KARLIN: And we don't want a lot of  
7 attachments.

8 MR. LEWIS: I do intend to submit it in  
9 the form of an affidavit or a declaration because it  
10 is factual. It is --

11 JUDGE KARLIN: Oh, I see. Well, okay.

12 MR. LEWIS: But I will still keep to 10  
13 pages.

14 JUDGE KARLIN: Great and how many pages of  
15 attachments?

16 MR. LEWIS: Nine?

17 JUDGE KARLIN: Nine, okay. I mean, just  
18 keep it --

19 MR. LEWIS: I'll keep the whole thing to  
20 10.

21 JUDGE KARLIN: We don't want 300 pages of  
22 material. That's fine. Okay, so we'll allow the  
23 Applicant to submit something in 10 days.

24 MR. LEWIS: I appreciate that, Judge  
25 Karlin, thank you.

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1 JUDGE KARLIN: Great. So that covers the  
2 item you wanted to. The housekeeping and other items  
3 we wanted to cover, Mr. Biggins, did you all have  
4 something?

5 MR. BIGGINS: Yes, along with the  
6 housekeeping items, Judge, any input that you wanted  
7 to give us at this point in regards to the form of our  
8 proposed findings of fact in order --

9 JUDGE KARLIN: Yeah, we were going to get  
10 to that.

11 MR. BIGGINS: -- okay, in order to make  
12 them as useful to the Board as possible.

13 JUDGE KARLIN: Okay.

14 MR. BIGGINS: And also we would appreciate  
15 an opportunity to review and provide corrections to  
16 the transcript.

17 JUDGE KARLIN: Yes, we're going to cover  
18 that also. That's a good point.

19 MR. BIGGINS: Thank you, your Honor.

20 JUDGE KARLIN: Those are good points.  
21 We'll cover them. While we're all on that, we might  
22 as well just do the transcript. What I would suggest  
23 is let's go until May 9<sup>th</sup>, any corrections to the  
24 transcript, that's Wednesday, May 9<sup>th</sup>, almost two  
25 weeks. And if you have corrections to the transcript,

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1 I mean, there's sort of two categories. One is just  
2 typos and name spellings and that sort of thing, but  
3 if there's anything more substantive that you think  
4 was incorrect, I would say consult -- listen to the  
5 tapes and tell me -- because when you come in, we want  
6 to know what the tape said. Because when we try to  
7 decide whether to correct it, we'll have to listen to  
8 the tapes.

9 So it's not a time to gussy up the  
10 testimony or to correct a misstatement. If it was on  
11 this tape as a statement, that's what we end up with.  
12 And both parties would have until the 9<sup>th</sup>, and  
13 hopefully you can concur on whatever corrections you  
14 have to the transcript. We also -- Mr. Biggins had  
15 earlier mentioned a concern about one of the documents  
16 we were referring to and so we want to present and add  
17 into evidence as a Board Exhibit 1, the Liquid  
18 Radioactive Release Lessons Learned Task Force Final  
19 Report dated September 1, 2006 by the NRC. Do you all  
20 have any objection to that?

21 MR. BIGGINS: We have no objection to  
22 that, Judge.

23 JUDGE KARLIN: Okay.

24 MR. LEWIS: No, sir, I have no objection  
25 with the understanding it's being introduced solely

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1 with respect to the extent to which witnesses referred  
2 and responded to it, not with respect to some factual  
3 assertion that may be in there that we've had no  
4 chance to respond to.

5 JUDGE KARLIN: Yes, that would be  
6 absolutely correct. So we're going to add that to the  
7 -- I don't have three copies, I'm sorry. Mine is all  
8 marked up but we will put it in and if you all want  
9 copies, we can send them to you. But hopefully you  
10 can access them. Is that all right? Okay.

11 (Board Exhibit 1 marked for  
12 identification and was received  
13 in evidence.)

14 JUDGE KARLIN: So we will be closing the  
15 evidentiary hearing -- evidentiary record today. This  
16 is the end, the evidentiary record is closed with the  
17 exceptions of the corrections to the transcript which  
18 we will look for by --

19 MR. LEWIS: And my post-hearing  
20 submission.

21 JUDGE KARLIN: All right, and that  
22 exception, your submission in 10 days. Let's make  
23 that on the 9<sup>th</sup>, well, yeah, the 9<sup>th</sup>, May 9<sup>th</sup>. I'll  
24 give you a little more time.

25 Now, on the proposed findings of fact and

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1 conclusions of law, we -- I mean, the regs usually  
2 call for after a hearing for each of the parties to be  
3 able to present proposed findings of fact and  
4 conclusions of law. Those are often very useful and  
5 what I like and I think we would like to have is  
6 citations to the transcript, citations to the  
7 exhibits, so that when we turn to writing the  
8 decision, that's what we try to do is cite to the  
9 transcript and to the evidence and to the documents to  
10 support, you know, propositions or findings that we  
11 make.

12 So that's the approach we would like you  
13 to take. However, we've talked about this a little  
14 bit, you've already submitted, both parties have  
15 already submitted you know, a statement of position on  
16 April 10<sup>th</sup>, which reads a lot like what you might end  
17 up writing as the proposed findings of fact and  
18 conclusions of law absent citations to the transcript  
19 obviously. So we're not sure what additional --  
20 whether a great additional value would be obtained by  
21 having you submit proposed findings of fact and  
22 conclusions of law. So I would like to solicit your  
23 reaction of whether you'd like to dispense with that  
24 or want to continue with that. I mean, we wouldn't  
25 withdraw it if you say you want it, but I mean, if you

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1 both agree that it doesn't -- is not needed, then  
2 maybe we won't need it.

3 MR. LEWIS: My preference would be to  
4 submit proposed findings because there's been a lot of  
5 discussion in these several days of hearings on a  
6 number of issues and those aren't addressed in our  
7 pretrial statement and certainly on those matters, it  
8 would be useful for the parties to lay out their  
9 positions. I mean, perhaps we could simply submit,  
10 you know, proposed findings on the specific topics  
11 that we've heard here today, leaving the more general  
12 one --

13 JUDGE KARLIN: No, I mean, but okay, I  
14 hear you. You do not want to waive the opportunity to  
15 submit --

16 MR. LEWIS: I think there was a lot said  
17 here and quite a record and it deserves, you know,  
18 proper unraveling and the input of the parties.

19 JUDGE KARLIN: All right.

20 MR. BIGGINS: Your Honor, we were of  
21 similar mind in that proposed findings based on the  
22 seven topics that were presented to the Board would be  
23 appropriate.

24 JUDGE KARLIN: Okay, well, with that, we  
25 will then not -- we will continue to request and

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1 require the submission of proposed findings of fact  
2 and conclusions of law, that those should be submitted  
3 with regard to all of the issues, the six fundamental  
4 issues that we must make decisions on, because that's  
5 how we have to write our decision and the -- if you  
6 want to specifically address the seven topics, great.  
7 Now, that's entirely appropriate and so we'll just  
8 reserve that.

9 I'm not sure what the time frame we had on  
10 that but whatever it is, we'll just continue it. I  
11 think it's about two weeks from now. So we'll leave  
12 the -- we'll expect those to be submitted. Please  
13 cite the transcript, cite the exhibits. This is  
14 helpful as we turn to writing our ruling.

15 MR. BIGGINS: Judge, that would be May  
16 11<sup>th</sup>, I believe.

17 JUDGE KARLIN: Okay, May 11<sup>th</sup>, thank you.

18 MR. BIGGINS: And may I also address the  
19 Applicant's submittal due on May 9<sup>th</sup>? We would  
20 appreciate an opportunity to respond to that. We  
21 don't know at this time that we would have a response  
22 but if we did believe a response was necessary, we  
23 would like an opportunity to respond.

24 JUDGE KARLIN: Wait a second, this is a  
25 factual statement that he's going to submit, an

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1 affidavit. What are you going to respond that's going  
2 to be relevant to the issue? I mean, I don't see --  
3 we don't want to get into that. We've got to issue a  
4 decision here in pretty quick order and I don't think  
5 it's all that novel or amazing of an issue for a  
6 response.

7 MR. BIGGINS: Well, Judge and that would  
8 be, you know, our question is well, having not seen  
9 his statement or know precisely what he proposes to  
10 submit, we would at least like the opportunity to  
11 review it and if we felt that there was something that  
12 could help clarify an issue for the Board's  
13 consideration, that would be our response.

14 JUDGE KARLIN: The relevant issue is  
15 whether the staff looked -- adequately looked at the  
16 candidate sites within the region of interest and did  
17 a thoughtful analysis to reduce it to the alternative  
18 sites that were reviewed in further depth. What he's  
19 going to submit is going to be irrelevant to that  
20 basically. He's going to say what Dominion did.

21 If the staff wants to submit something  
22 that says, "Oh, we did do a review of this, that or  
23 the other, and we'd like to submit an affidavit on  
24 that", but as a rebuttal to this, no, I mean, I think  
25 that's a problem. Do you want to submit something

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1 simultaneously?

2 MR. BIGGINS: I don't think that would be  
3 necessary.

4 JUDGE KARLIN: Okay.

5 MR. LEWIS: Judge Karlin, what is 10 days  
6 from today? I'm willing to --

7 JUDGE KARLIN: Ten days, I believe is the  
8 10<sup>th</sup> of May. I'm sorry, that's two weeks, that's two  
9 weeks, the 10<sup>th</sup> of May is two weeks. What is 10 days?  
10 Probably a Sunday.

11 JUDGE COLE: It looks like Sunday, May  
12 6<sup>th</sup>.

13 MR. LEWIS: I'm willing to submit my  
14 statement by May 7<sup>th</sup> and the staff could provide a  
15 response by May 9<sup>th</sup> and there would be no impact on  
16 the schedule if they want. So I'll do that to  
17 accommodate them.

18 JUDGE KARLIN: May 9<sup>th</sup>, give them a  
19 weekend, hey. You're a nice guy.

20 MR. LEWIS: No, I took the weekend.

21 MR. BIGGINS: We really do not anticipate  
22 needing to file a response. We would just like the  
23 opportunity if we did, you know, see something.

24 JUDGE KARLIN: Okay, so what's the date  
25 you're proposing?

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1 MR. LEWIS: Monday, May 7<sup>th</sup>.

2 JUDGE KARLIN: Okay, and that would be --

3 MR. LEWIS: May 9<sup>th</sup>, which was my original  
4 date so there's no impact on the schedule.

5 JUDGE KARLIN: Okay, that's two days.  
6 Well, we'll give you till Friday, what's that day?

7 MR. LEWIS: I'm sorry, I don't have a  
8 calendar.

9 JUDGE KARLIN: The 11<sup>th</sup>, okay. All right,  
10 was that helpful, Mr. Biggins?

11 MR. BIGGINS: Yes, your Honor, thank you.

12 JUDGE KARLIN: Okay. I think we've  
13 covered everything. Let me just confer with my  
14 colleagues.

15 (Pause)

16 JUDGE ELLEMAN: Further on housekeeping  
17 items, the staff has been sending e-mail copies to me  
18 at my NRC e-mail address and I would prefer it come to  
19 my address at my home because there's a bit of delay  
20 in my accessing the NRC address. That home e-mail  
21 address is my last name, elleman@at ncsu, which is  
22 North Carolina State University, .edu. And that will  
23 speed up my receipt of anything you send me. Thank  
24 you.

25 JUDGE KARLIN: Okay, I think that covers

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1 it. Where do we go from here? We will look forward  
2 to the submissions that we've just discussed, proposed  
3 findings of fact and conclusions of law. We will  
4 confer and read and try to think it through. We plan  
5 to try to issue a ruling in this matter, a decision,  
6 by the end of June, hopefully even before that if we  
7 can. And so that's our hope and approach.

8 And appreciate all time and effort the  
9 staff and the applicant put into this. We -- this is  
10 an early site permit, mandatory hearing. The  
11 Commission recognized in its decision of July of '05  
12 that the Boards would have some different flexibility  
13 in how to do this and I think the three ESP  
14 proceedings have been slightly different and maybe  
15 we've learned a little bit from the other two, maybe  
16 not. We try to issue our written questions in one way  
17 on safety and one way on environmental. They were  
18 pretty a big wave and you all did a lot of work.

19 That may have -- not issuing a follow-up  
20 set of written questions may have resulted in a little  
21 bit longer interrogation here today when we ask  
22 questions on the specific topics, but it was helpful  
23 to us. I think we all think it was quite helpful to  
24 us, both your written answers and the answers here  
25 today. So it's a serious matter and we will take it

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1 under advisement and rule accordingly.

2 So thank you all for coming and we'll  
3 adjourn at this point.

4 (Whereupon, at 1:53 p.m. the hearing in  
5 the above-entitled matter concluded.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

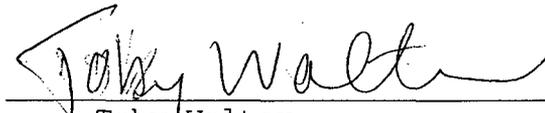
Name of Proceeding: Dominion Nuclear North Anna

Docket Number: 52-008-ESP

ASLBP No. 04-822-02-ESP

Location: Louisa, Virginia

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.



Toby Walter  
Official Reporter  
Neal R. Gross & Co., Inc.

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